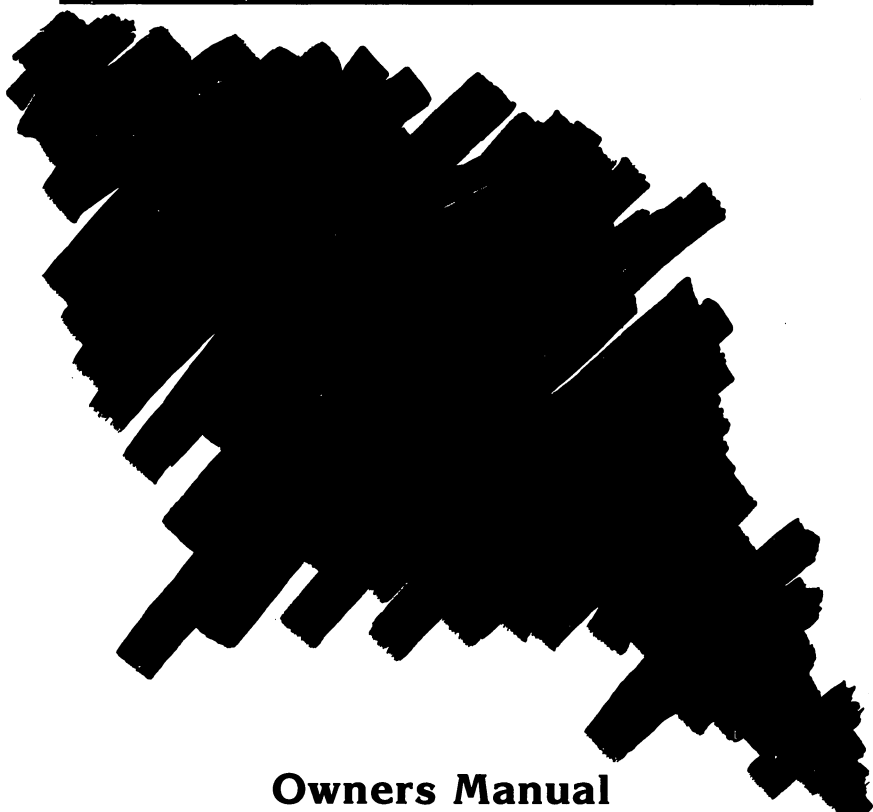


PIXmateTM

TOTAL IMAGE PROCESSING SYSTEM



Owners Manual

**PROGRESSIVE
PERIPHERALS
& SOFTWARE**

PIXmate™

TOTAL IMAGE PROCESSING SYSTEM



Credits and Notices

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Published by:

**Progressive Peripherals & Software, Inc.
464 Kalamath Street
Denver, CO 80204
(303) 825-4144**

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TABLE OF CONTENTS

Credits and Notices	Page
1.0 Introducing PIXmate	I-1
1.1 Minimum Hardware Requirements	
1.2 Contents of the PIXmate Master Disk	
1.3 Acknowledgments	
2.0 Introduction to Image Processing	I-2
3.0 How to Use this Manual	I-3
4.0 How to Safely Make Legal Copies of PIXmate	I-3
4.1 Using One Disk Drive and the Workbench Icons.	
4.2 Using Two Disk Drives and the Workbench Icons.	
4.3 Using One Disk Drive and the AmigaDOS CLI.	
4.4 Using Two Disk Drives and the AmigaDOS CLI.	
5.0 Installing PIXmate on Any Disk or Hard Disk Drive	I-4
6.0 How to Get PIXmate Running on Your Amiga	I-4
6.1 Loading from the Workbench	
6.2 Loading from the AmigaDOS CLI	
6.3 In Case of Trouble Loading PIXmate	
7.0 PIXmate Operating Conveniences	I-5

TUTORIAL SECTION

T1.0 Getting Started with PIXmate, Step by Step	T-1
T1.1 Loading the Tutorial Image	
T2.0 Quick Tour of Commonly Used Editing Features	T-2
T2.1 How to Undo Changes	
T2.2 Using the Two PIXmate Screens	
T2.3 Clipping, Cutting, and Clearing Areas	
T2.4 Moving the Screen and Image	
T3.0 Adjusting Colors	T-6
T3.1 Using the Palette Window	
T3.2 Using the Color Bias Window	
T3.3 Reducing the Number of Colors in an Image	
T3.4 Extracting Colors from Images	
T4.0 Introduction to the Display Control Window	T-10
T5.0 Introduction to the Image Processor	T-10
T5.1 Logical Operations	
T5.2 Pixel Operations	
T5.3 Matrix Operations	

REFERENCE SECTION

	Page
R1.0 Image File Management	R-1
R1.0.1 Pathnames and Filenames	
R1.0.2 Legal Names	
R1.0.3 Wildcards in Names	
R1.1 Using the PIXmate File Selector	R-3
R1.1.1 Title Bar and Depth Arrangement Gadgets	
R1.1.2 File Display Area	
R1.1.3 Scroll and Slide Gadgets	
R1.1.4 String Gadgets	
R1.1.5 Action Gadgets	
R1.1.6 Device Gadgets	
R1.1.7 Sort Gadgets	
R1.1.8 Project Menu	
R1.2 Using Interchange File Format (IFF) Image Files	R-9
R1.2.1 Loading IFF Image Files	
R1.2.2 Saving IFF Image Files	
R1.2.3 IFF Image File Compression	
R1.3 Using Other File Formats	R-11
R1.3.1 Reading and Writing IFF Palettes	
R1.3.2 Reading and Writing Raw Image Formats	
R1.3.3 Reading Old-Style Digi-View Image Files	
R1.3.4 Reading Atari Neochrome Image Files	
R1.4 Deleting Files	R-12
R1.5 Using Multiple Filenames	R-13
R1.5.1 Specifying Multiple Filenames	
R1.5.2 Working with the Previous File	
R1.5.3 Working with the Next File	
R1.6 Quitting PIXmate	R-14
 Edit Menu	
R2.1 Operations Using the Undo Buffer	R-14
R2.1.1 Undo Features and Limitations	
R2.1.2 Killing the Undo Buffer	
R2.1.3 Disabling the Undo Feature	
R2.2 Operations Involving the Current Screen	R-15
R2.2.1 Disabling the Screen Title Bar	

R2.2.2 Disabling the Pointer Sprite	Page
R2.2.3 Clearing the Screen	
R2.2.4 Clearing Part of the Screen	
R2.2.5 Moving and Centering the Screen	
R2.2.6 Moving the Image on the Screen	
R2.3 Operations Involving the Other Screen	R-17
R2.3.1 Flipping to the Other Screen	
R2.3.2 Copying an Image to the Other Screen	
R2.3.3 Copying Part of an Image to the Other Screen	
R2.3.4 Cutting Part of an Image to the Other Screen	
R2.3.5 Killing the Other Screen	
R2.4 MultiTasking with Other Programs	R-18
R2.4.1 Grabbing Another Screen	
R2.4.2 Grabbing Deluxe Paint Screens	
 Color Menu	
R3.1 Color Operations	R-20
R3.2 Using the Color Cycling Feature	R-20
R3.3 The Palette Window	R-20
R3.3.1 How the Palette Colors are Displayed	
R3.3.2 Selecting and Adjusting Colors	
R3.3.3 Palette Editing Gadgets	
R3.3.4 Adjusting Color Cycling	
R3.4 The Color Bias Window	R-28
R3.4.1 Adjusting Contrast, Saturation, and Intensity	
R3.4.2 Adjusting Red, Green and Blue Balance	
R3.5 Packing Colors	R-30
R3.6 Sorting Colors	R-30
R3.7 Using Fewer Colors	R-31
R3.8 Performing Color Extractions	R-31
R3.8.1 Automatic Extractions	
R3.8.2 Specialized Extractions	
R3.9 Merging Color Extractions	R-43
R3.9.1 Automatic RGB Merges	
R3.9.2 Specialized Merges	
R3.10 Color Mode Conversions	R-36
R3.10.1 Converting HAM 4096 Color Image to 32 Colors	
R3.10.2 Converting HAM 4096 Color Images to 64 Colors	
R3.10.3 Converting Low Resolution Images to HAM Mode	

R3.11 Matching Colors with Other Images	R-38
--	-------------

R3.11.1 Matching Colors with the Other Screen

R3.11.2 Matching Colors with an IFF Image File

R3.12 Additional Color Manipulations	R-39
---	-------------

R3.12.1 Copying the Palette to the Other Screen

R3.12.2 Exchanging Palettes with the Other Screen

R3.12.3 Complementing Colors

R3.12.4 Pseudo-Coloring an Image.

Effects Menu

R4.1 The Display Control Window	R-40
--	-------------

R4.1.1 Changing the Bitplanes

R4.1.2 Changing the ViewModes

R4.1.3 Reformatting and Image

R4.1.4 Resizing an Image

R4.2 The Image Processor Window	R-50
--	-------------

R4.2.1 Logical Operations in Detail

R4.2.2 Pixel Operations in Detail

R4.2.3 Matrix Operations in Detail

R4.2.4 The Slide Controls

R4.2.5 Data Modes

R4.2.6 Processing Modes

R4.3 The HistoGraphic Equalizer Window	R-61
---	-------------

R4.3.1 Adjusting Color Distribution with the Equalizer

R4.4 Automatically Reformatting Images	R-66
---	-------------

Info Menu

R5.1 Memory Usage Information	R-67
--------------------------------------	-------------

R5.2 Display Format Information	R-69
--	-------------

R5.3 The Pixel Count Window	R-69
------------------------------------	-------------

R5.4 The Coordinate Display Window	R-73
---	-------------

R5.5 The Credits Display	R-73
---------------------------------	-------------

Miscellaneous

R6.0 Working with Low RAM Conditions	R-75
---	-------------

R7.0 How the Amiga Graphics Modes Affect the Display	R-76
---	-------------

R7.1 The Four Basic Graphics Modes	R-77
---	-------------

R7.2 HAM 4096 Color Mode	R-79
---------------------------------	-------------

R7.3 EXTRA-HALFBRITE 64 Color Mode	R-79
---	-------------

APPENDIX

- A. Tips and Techniques for Image Processing**
- B. Warnings, Error Messages and Recovery Procedures**
- C. Suggested Reading**
- D. Customer Service and Support**

Glossary of Terms

G-1

Index

i-1

1.0 Introducing PIXmate

Congratulations! You have purchased the most sophisticated, state-of-the-art, combination image processing and graphics special effects software package available for the Amiga computer. Don't worry, despite all that, using PIXmate is easy! PIXmate uses the standard Amiga Intuition mouse and menu system, so there is a good chance you already know how to operate PIXmate.

There is absolutely no way PIXmate can hurt your Amiga, so feel free to try anything you like. There is no 'right' or 'wrong' way to use PIXmate; unleash your creativity and experiment!

1.1 Minimum Hardware Requirements

PIXmate works with the Amiga model 500, 1000, and 2000 computers using Kickstart/Workbench 1.2, and requires a minimum of 512K of RAM and a single 3.5" disk drive. One megabyte of RAM is recommended to achieve maximum performance from PIXmate. Additional disk drives or a hard disk provide extra storage convenience, but are not required.

1.2 Contents of the PIXmate Master DiskRoot Directory:

Root Directory:

Name	Description
Disk.info	PIXmate disk icon
PIXmate	The PIXmate program file
PIXmate.info	The PIXmate program icon
PIXmate.DATA	The PIXmate data file
PIXmate.DATA.info	The PIXmate data icon
Tutorial__Images	A directory containing pictures
Tutorial__Images.info	Tutorial__Images drawer icon
Demo__Images	A directory containing more pictures
Demo__Images.info	Demo__Images drawer icon

Tutorial__Images Directory:

Name	Description
Abe.LORES	A familiar face used in the tutorial

Demo__Images Directory:

Name	Description
Abe.LACE	Interlace version of tutorial image
Butterfly.HAMLACE	A colorful insect
Earth.HIRESLACE	Our home, as seen from space
Lion.HAMLACE	A ferocious feline face
Mars.HIRESLACE	A closeup of the Martian landscape
Moon.HIRESLACE	A small step for man
Swamp.LACE	A dark and damp section of land

1.3 Acknowledgments

PIXmate is the distillation of thousands of person-hours and guru meditations. I am deeply indebted to many fine people for their contribution in making PIXmate possible. To Will Wright, the creative genius and programmer extraordinaire, and Mike Richard, who spent uncounted hours improving, promoting, and debugging. To Malcolm Dougherty, advisor on user interface. To Dave Milligan, the coauthor of CLImate, for support and advice. To Randy Jouett, for debugging and brainstorming. To Carolyn Scheppler, who writes Amiga code examples and dares to document the undocumented. To Progressive Peripherals & Software, Inc. who have that rare combination of spirit and savvy. And of course, to those wizards of wonder, the original Creators of the creative edge from Los Gatos. A deep bow and Thanks! --Justin

2.0 Introduction to Image Processing

Image processing is the marriage of computer and space-age techniques for improving digital images. Processing techniques were initially developed to enhance television images returned from the Moon by space probes. Later, image processing was applied to improving the quality of x-rays. Until recently, only governments and major universities could afford to perform image processing; PIXmate lets you explore the possibilities of image processing for your own applications.

Improving the quality of digitized pictures is one application for image processing. You can bring out details by emphasizing edges, or improve the contrast of a image. Enhancing images is more of an art than a science; the best technique to use is the one that improves the details you are interested in. While there are some general guidelines you can follow, trial and error combined with experience are your best guide to success. The art of enhancement is knowing when to stop; PIXmate lets you easily 'back up' a step and decide which image looks better. Often, a combination of several processes will produce the desired result.

Another way to use image processing is to produce unusual graphics effects with existing artwork or images. An easily produced example of this is the rainbow color effect often used in television called 'solarization'. Another example is the photographic negative effect that reverses colors. PIXmate has virtually unlimited potential for creating and combining graphic effects.

A common use of image processing is to alter an existing image to match some particular format or application. For instance, you might have some color image files that you want to reduce in size by half and convert to black and white for printing purposes.

3.0 How to Use this Manual

This manual is divided into two main parts: a tutorial section, and a reference section. The Tutorial section is designed to give you 'hands-on' experience with some of the features of PIXmate, using a tutorial image from the PIXmate disk. The Reference section provides in-depth information on every operation in PIXmate, and provides examples and advice on effective use.

You certainly do not have to read the entire manual to use PIXmate! Work through the quick tutorial session to get acquainted with PIXmate, then use the Reference section to explore other PIXmate features at your own pace. You can use the Glossary to explain any terms used in the Reference section that you may be unfamiliar with. The Index and the Table of Contents can be used to find information by topic. The Tips and Techniques section in the Appendix may be used in cookbook fashion to produce some useful effects.

PLEASE NOTE: A manual of this scope cannot be perfect. Great effort has been taken to produce a complete and accurate guide in an easy-to-read format, however, we welcome suggestions for improvement and apologize in advance for any errors that may be present.

4.0 How to Make Legal Copies of PIXmate

PIXmate has no copy protection scheme to prevent the original owner from making extra copies to protect your investment, or from installing PIXmate on a hard disk. There is no 'dongle' or key module to lose, and no irritating 'look-up-the-word' password system to impede you. Please do not abuse this privilege by making PIXmate freely available to other people. We have purposely kept the price of PIXmate very modest. We believe that a program worth using is worth buying; only you can prevent software piracy.

After you purchase PIXmate, the first thing you should do is make a copy of the PIXmate disk (your work disk) and put the original disk (called the master disk) in a safe place. Keep all disks away from magnetic fields and avoid places with extreme temperatures or direct sunlight. **Always use the copy of PIXmate rather than the master-disk!** Use another disk (either a blank disk, or one that contains information you do not need anymore) as a destination for the copy process. We recommend use of a high-quality, double-sided diskette.

Before diving into the copy process, take this simple precaution: make sure your PIXmate master disk **IS** write-protected. This prevents you from accidentally erasing the PIXmate master disk. A disk is write-protected if the small plastic tab is slid toward the top of the diskette (away from the metal shutter), allowing you to see clear through the hole in the diskette casing. Also make sure that the destination diskette is **NOT** write-protected (i.e., the plastic tab is in the bottom position, covering the hole), or the disk copy process will fail.

For step-by-step instructions of disk duplication, refer to your Amiga documentation.

5.0 Installing PIXmate on Any Disk or Hard Disk Drive

As a convenience, PIXmate may be installed on any disk or in any directory, if there is sufficient storage space to hold the program and its data file. To do this, you need to copy both the 'PIXmate' file and the 'PIXmate.DATA' file to the directory of your choice, either by using the Workbench icons, or by using the AmigaDOS CLI to type the filenames, or by using a utility program like CLImate.

6.0 How to Get PIXmate Running on Your Amiga

Load your *copy* disk of PIXmate from either the Workbench icon environment, or from the AmigaDOS CLI keyboard environment.

6.1 Loading from the Workbench:

Insert your PIXmate work disk into any disk drive. After a moment, the PIXmate disk icon will appear on the Workbench screen. Position the mouse pointer directly over the disk icon, then (double-click) the Left Mouse Button. A window will appear in the upper left corner of the screen, titled 'PIXmate', and four icons will appear in the window. Put the mouse pointer directly over the icon labeled 'PIXmate' (the largest icon), then double-click the Left Mouse Button. The program will then load, and after a few seconds, you should be greeted by the PIXmate title screen.

6.2 Loading from the AmigaDOS CLI:

Insert your PIXmate work disk into any disk drive (i.e., DF0:, DF1:, etc.). At the CLI prompt (usually '1 '), type 'PIXmate:PIXmate' and press RETURN. The program will then load, and after a few seconds, the PIXmate title screen should appear. In either Case: After looking at the obligatory title screen, press any key on the keyboard or either mouse button to clear the title screen and begin using PIXmate.

6.3 In Case of Trouble Loading PIXmate:

If for some reason the PIXmate title screen does not appear after the disk drive light goes off, or if a warning message appears instead, check the following before contacting Customer Service:

* You may have gotten a request window titled 'PIX Low MemoryWarning:', followed by an advisory that suggests you need more RAM. PIXmate checks how much memory is available after loading, and complains if there is less than 256K of RAM free at this point. You can still use PIXmate under these circumstances, but some operations may require more RAM than is available, especially when using high-resolution images. By clicking on the gadget labeled 'Understood' with the Left Mouse Button, the warning will disappear and the PIXmate title screen will pop up. See the section 'Working with Low RAM Conditions' for more details.

* If you own an Amiga 1000, make sure you are using Kickstart/Workbench Version 1.2 or later! PIXmate will not work with the outdated versions of the Amiga operating system.

* PIXmate needs a minimum of 200K of RAM to load; make sure you have at least 230K before loading. Running completely out of RAM or operating very close to the limit is not recommended, since the operating system may 'crash' if it cannot allocate memory, even if PIXmate has successfully loaded.

* If you have copied PIXmate to a new place, remember that the file 'PIXmate.DATA' must also be copied to the same directory. PIXmate needs the data file to initialize itself.

7.0 PIXmate Operating Conveniences

After you have successfully loaded PIXmate, there are some conveniences and shortcuts that will make your use of PIXmate more productive. When the flashy title screen has cleared, you will be greeted with a blank screen with the title 'PIXmate 1.0' at the top of the screen (see Figure T1.0). The Title Bar is used to display messages from PIXmate, and after you have loaded an image, shows the filename of the image you are currently working on.

You can 'drag' the screen by the Title Bar, using the Title Bar as a handle to pull the screen down. This function is similar to most Amiga software applications. The screen will follow the mouse pointer, moving smoothly down the display, and revealing the screen behind it (in this case, the Workbench screen).

At the upper right-hand corner of the Title Bar are the two Foreground/Background Gadgets. By positioning the mouse over left-most of the two gadgets and pressing the Left Mouse Button, the current screen is placed behind all other screens. Clicking on the rightmost gadget puts that screen on top of all other screens.

A handy shortcut is to use the keyboard equivalents of these operations; pressing the LeftAmiga-N keys down together causes the Workbench screen to be the topmost screen. Pressing LeftAmiga-M places the Workbench screen underneath any other screen. Note: on the Amiga 500 and 2000, the LeftAmiga key has been changed to the Commodore Key, abbreviated 'C⁵'. This manual will consistently refer to this key as the Left-Amiga key to avoid confusion.

PIXmate uses your Workbench colors whenever possible. You can adjust the colors PIXmate uses by adjusting your Workbench colors using the Preference utility program on the Workbench 1.2. Occasionally, you may find it hard to see the Title Bar due to dark colors in the image. You can position the mouse pointer anywhere below the Title Bar and press the Left Mouse Button to temporarily use the Workbench colors. This should make the Title Bar easy to read. When you are finished reading the title, just release the mouse button.

At the top of the Workbench screen, just to the left of the two Workbench screen depth gadgets, is the PIXmate Main Window. This is a small rectangular box labeled 'PIX', with a square box on the left side of the window. This square box, referred to as a CLOSEWINDOW gadget, can be used to quit PIXmate at any time, similar to a master power switch. Simply position the mouse pointer over the gadget box, then press and release (click) the Left Mouse Button. PIXmate will finish whatever it is doing and quit at the next possible moment.

During PIXmate processes that take more than a moment, the mouse pointer will change to the familiar 'ZZ' busy cloud image, letting you know that PIXmate is running and busily performing the task you requested. When using PIXmate's image processing features (some of which can take several minutes!) you can press the SPACEBAR to stop the process. PIXmate will abort processing at the next possible moment, and try to restore the original unprocessed image. Thus, if you decide halfway through a process that the results are not what you want, you can press the SPACEBAR and try a different technique in a matter of seconds, without waiting for the current operation to run its course.

Many of the most commonly used PIXmate features can be selected from the keyboard, instead of using the mouse and menu system. These keyboard equivalents, called keyboard shortcuts, are printed in the PIXmate menus next to the menu item they select. For instance, the 'Undo Changes' feature from the Edit Menu can be either selected using the mouse, or by pressing the 'u' key. Other keyboard shortcuts require pressing two keys simultaneously. These shortcuts will appear next to the menu item they select, with a funny looking capital letter 'A' followed by another capital letter. For instance, next to the 'Load IFF' item in the Project Menu, you will see something like 'A L' printed. This means pressing the Right-Amiga Key and the 'L' key together selects 'Load IFF', just like using the mouse would. Whenever possible, PIXmate uses easy to remember letters for the shortcut keys; 'U' for Undo, 'P' for Palette, 'Right-Amiga-L' for Load, etcetera. This shortcut system will make more sense after you use PIXmate awhile; it can be much quicker than using the mouse and menus once you get the hang of it.

TUTORIAL SECTION

Figure T1.0

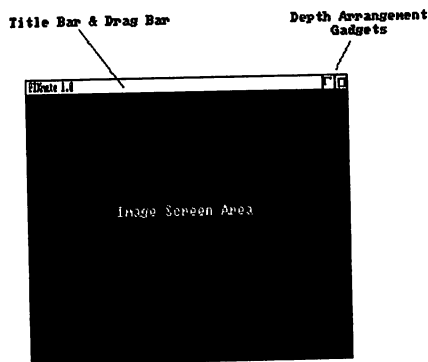
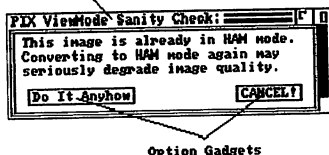


Figure T1.0 The PDmate Screen

Title Bar, General Message Description



Option Gadgets

Figure B. A Typical PDmate Requester



TUTORIAL SECTION

T1.0 Getting Started With PIXmate, Step by Step

In this tutorial, we are going to show you how to perform some of the most commonly used PIXmate features in a step by step, 'hands-on' fashion. We will use an image file from the PIXmate disk for this tutorial session. If the tutorial uses any terms you are unfamiliar with, refer to the Glossary at the back of the manual for a short description.

Before you start this tutorial, make sure you have read the previous chapters, 'How to Safely Make Legal Copies of PIXmate', 'How to Get PIXmate Running on Your Amiga', and 'PIXmate Operating Conveniences'. If you have never used the Amiga Workbench, it is recommended you read the Amiga Owners Manual that came with your Amiga before proceeding.

At this point, you should have your working copy of PIXmate loaded and running, with a blank screen that looks something like Figure T1.0. If this is not the case, please refer to the 'In Case of Trouble' part of the section 'How to Get PIXmate Running on Your Amiga'

T1.1 Loading the Tutorial Image

A blank screen is boring, so the first thing we need to do is load the tutorial image from the PIXmate work disk. To accomplish this, we will use the PIXmate File Selector to find the file we want.

1. Press down the Right Mouse Button and hold it down. Notice that the screen Title Bar changes; instead of reading 'PIXmate 1.0', it now reads 'Project Edit Color Effect Info'. These five words are the main menu headings for PIXmate. The one we want is Project.

2. While still holding the Right Mouse Button down, slide the mouse pointer (using the mouse, of course) until it is directly over the word 'Project' in the Title Bar. The Project Menu will 'drop down', displaying several menu items. The first menu item is labeled 'Load IFF A L'. Slide the pointer down slightly until it is directly over the 'Load IFF' item. Notice that the menu item has changed color; this is called highlighting. Now, release the Right Mouse Button. This selects the 'Load IFF' menu item.

3. The PIXmate File Selector will appear on the Workbench screen. If you loaded PIXmate using the Workbench icon, the display area in the File Selector will begin to fill with names of files from the PIXmate disk, and you can move on to Step 4.

If you loaded PIXmate from the CLI, the File Selector will display names of files from your current CLI directory. In this case, you may have to use the File Selector to change directories to the PIXmate work disk. Notice the boxes in the lower right of the File Selector, under the label 'DEVICE'.

If the PIXmate disk is in the internal disk drive (DF0:), position the mouse pointer over the box labeled 'DF0:', then click the Left Mouse Button. If the PIXmate disk is in the external drive, click on the 'DF1:' box. The File Selector should begin reading filenames from the PIXmate disk. Should you have problems, the Reference Section covers all the features of the File Selector in great detail.

4. After the File Selector has finished reading the disk (the title bar will say 'Select Filename:'), notice that there are two entries that stand out from the rest; they are a different color than the other filenames, and they have the word 'DIR' in front of their name. These are the two directories with image files that come with the PIXmate disk. The tutorial image is located in the directory named 'Tutorial__Images'. Position the mouse pointer over the 'Tutorial__Images' entry, then click the Left Mouse Button. This will force the File Selector to read and display names from the Tutorial__Images directory.

5. In the Tutorial__Images directory, there is only one entry, named 'Abe.LORES'. This is the tutorial image file. Position the mouse pointer over the name, then quickly press and release the Left Mouse Button twice (double-click). This selects the file 'Abe.LORES' for loading. The File Selector will disappear, and the mouse pointer will change to the little 'ZZ' busy cloud image while the file loads from disk. After about five seconds, the soon to be familiar tutorial image (Abe) will appear on the PIXmate screen.

As mentioned in the section 'PIXmate Operating Conveniences', if you position the mouse pointer anywhere below the Title Bar, then press the Left Mouse Button, the screen colors will change to your Workbench colors. This will make the Title Bar easy to read (it will say 'Abe.LORES'). Releasing the button changes the colors back.

T2.0 Quick Tour of Commonly Used Editing Features

Great! You have successfully loaded the tutorial image, and in the process, have become acquainted with selecting menu items, clicking on gadgets, and using the File Selector. Now that we have an image to play with, the fun begins!

We are now going to cover some editing features of PIXmate available under the 'Edit' menu heading. Hold down the Right Mouse Button, and put the mouse pointer over the word 'Edit' on the Title Bar. The Edit Menu will appear. Most of the Edit Menu items perform cut and paste type operations.

T2.1 How to Undo Changes:

The first menu item, labeled 'Undo Changes', is the most important of the Edit Menu functions. When you select 'Undo Changes' from the Edit Menu, or press the 'u' key on the keyboard, PIXmate 'undoes' the last operation performed. This allows you to try a PIXmate feature, then 'Undo Changes' if you want to try something different (or simply dislike the results). If no changes have been made, 'Undo Changes' will appear to do nothing. Throughout the tutorial, you will be asked to use the Undo feature to restore the original tutorial image before proceeding to the next step. This will save you the time and bother of having to re-load the image (using 'Load IFF' Project option) between steps.

T2.2 Using the Two PIXmate Screens:

In addition to the current screen, PIXmate has a second screen simply referred to as the 'Other' screen. The Other screen is totally independent from the screen you are looking at; PIXmate can use either or both screens for performing operations. You can use the Other screen like a clipboard, or like a reserve 'Undo' feature.

To switch to the Other screen, select 'Flip to Other' from the Edit Menu, or press the 'f' key on the keyboard. Try it now. You will be greeted by a blank screen, with a screen Title Bar that reads 'Other Screen'. Now press the 'f' key again. The screen with Abe on it will appear. You can hold down the 'f' key and quickly flip between the two screens.

Note that whichever screen you are looking at is considered the Current screen; if you 'Flip to Other', the Other screen becomes the current, and the current becomes the Other (they exchange places).

Now use 'Flip to Other' to make the screen with Abe on it the Current Screen. Select 'Copy to Other' from the Edit menu, either by using the mouse, or by pressing 'c' on the keyboard. This makes an exact copy of the Current screen on the Other screen. Use 'Flip to Other' to check this out; the two screens are now identical!

Now select 'Clear Screen' from the menu (or press the 'x' key). The Current Screen is completely cleared. Now 'Flip to Other' again. Abe should still be on this screen. The Other screen is now blank.

T2.3 Clipping, Cutting, and Clearing Areas:

In the last section, we covered the basics of working with the two PIXmate screens; flipping, copying, and clearing screens should be pretty easy to understand. All of those operations affect the entire screen. In this section, we will demonstrate how you can work with just parts of a screen. Using the Clip, Cut, and Clear features, you can cut and paste parts of the Current screen to the Other, or selectively clear sections of the Current screen.

At this point, the Current screen should have the picture of Abe on it, and the Other screen should be cleared (if not, back to section T2.2 and do it!).

Select 'Clip to Other' from the Edit Menu (or press the 'k' key). The screen Title Bar will disappear, and the mouse pointer will grow slightly (a larger crosshair shape). You are now in Clip Mode; PIXmate is waiting for you to choose a section of the screen (an area) to clip.

Position the crosshair near the upper left corner of Abe's right eye (about the middle of the screen). Press the Left Mouse Button and hold it down. While holding the button down, slide the mouse down and to the right. A rectangle will appear and grow in size as you slide the mouse away from your 'starting point'. This rectangle is the area you are about to clip; try to surround the eye with the rectangular border. Now release the Left Mouse Button. The clipped area is copied to the Other screen. Use 'Flip to Other' to check this out; the only thing on the screen is the area you clipped. Using this technique, you can copy selected areas of the Current screen to the Otherscreen.

Flip back to the full picture of Abe. Now select 'Clear Area' from the Edit menu (or press the Right-Amiga-x keys together). Using the same technique we just described, clip the same area of the screen around Abe's eye. When you release the button, the clipped area of the screen will be instantly cleared. Now select 'Undo Changes' (or the 'u' key). The cleared area is restored! Select 'Undo' again. Now you are back to the image of Abe with the missing eye. Select 'Undo' once more before continuing to get the original image back -- we just wanted to show you that 'Undo' can undo itself as well.

There is a third Edit Menu feature, called 'Cut to Other', that is a combination of 'Clip to Other' and 'Clear Area' in one operation. You can try it if you like; just remember to use 'Undo' to get the original image back before proceeding.

T2.4 Moving the Screen and Image:

Terrific! You have mastered most of the operations involving using the two screens and the Undo feature.

Often, it may be useful to move the image around on the screen. PIX-mate has a couple of ways to do this; we will be using the cursor arrow keys to move the screen and image.

Get the image of Abe back on the current screen (if you have mangled it, use 'Load IFF' to re-load the image). Now use 'Copy to Other' to make a spare copy of Abe on the Other screen.

First of all, try pressing the four arrow keys; up, down, left, and right. Notice how the screen moves in the direction pointed to by the arrow key you pressed. If you hold an arrow key down, the screen will smoothly move in that direction. All that we are doing here is sliding the screen around on the monitor: this is handy when working with 'overscan' images that extend beyond the edges of the screen. If you select 'ReCenter' from the Edit Menu (or press the 'r' key) the screen will be centered back to its default position (i.e., before you used the cursor keys to move it). In addition, if you press the Right Mouse Button, the screen will be centered automatically.

Press the 'r' key now to center the screen. Now, while holding down the SHIFT key, try pressing the arrow keys. Once again, the image will move around in the direction of the arrow pressed. However, when you have the SHIFT key pressed, you are actually moving the image on the screen (as opposed to moving the screen on the monitor). Parts of the image that fall off the edge of the screen are permanently lost; even 'Undo' won't recover parts that you have 'pushed' off the edge of the screen. Don't worry, that is why we used 'Copy to Other' first: we still have the original image on the Other screen.

Holding down the SHIFT key in combination with the arrows for more than a moment causes the key to auto-repeat. The image will briskly move in the desired direction. Pressing SHIFT and an arrow key once moves the image a single column or row over.

To move the image around in larger steps, press the ALT key and an arrow key together. Each time you press the ALT-arrow combination, the image will jump half the screen in the desired direction. Note that it is very easy to push the image completely off the screen, leaving nothing but darkness.

Good thing we have a copy of the image on the Other screen! After you get bored with pushing the image around, use 'Flip to Other' to bring the original image of Abe back on the Current screen.

T3.0 Adjusting Colors

You have conquered most of the mysteries of the Edit Menu. This section will acquaint you with some of the items in the Color Menu. PIXmate has lots of ways you can manipulate the colors used by an image; we will touch on some of the most useful items. You do still have the image of Abe on the screen now, right?

T3.1 Using the Palette Window:

Select 'Palette' from the Color Menu (or press the 'p' key). The Palette window will 'pop-up' on the screen, covering part of the image. The screen will look something like Figure T3.1 at this point.

First of all, try this: press the Right Mouse Button down. Notice that the Palette window and the screen Title Bar disappears! You can see the entire image now. Release the mouse button, and the window pops back. If the Palette ever gets in the way of your image (or any other PIXmate window), you can use this feature to view the whole image at any time.

At the bottom of the Palette is the Color Bar, showing you the spectrum of colors used by the image. This spectrum, called the ColorMap, can be modified using the Palette controls.

Move the mouse pointer directly over the middle of the Color Bar, then press and hold the Left Mouse Button. Instantly, the Palette controls jump to match the new position you selected. While still holding the mouse button down, slide the mouse left and right. Notice how the small white marker on top of the Color Bar follows your mouse movements, and the other parts of the Palette that change when you move the mouse. When you release the button, the color in the Color Bar below the marker is selected. This is how you select a color in the ColorMap to modify.

Now try this: put the pointer directly over Abe's nose, then click the Left Mouse Button. The Palette will select the color under the pointer. This might be more useful than choosing colors from the Color Bar, if you need to change a particular color used in the image.

Select a color, it does not matter which one. Notice the three small white boxes to the right of the 'RGB' labels, inside of the long rectangles.

These are the Red, Green, and Blue slide control knobs. Position the mouse pointer directly over the knob to the right of the 'R' label. Now press and hold the Left Mouse Button, then slide the mouse left and right. As you move the mouse the color changes, either adding or removing red from the currently selected color. This is similar to using one of those fancy volume controls on a radio or television. Play around with the Green and Blue sliders also. By using these three controls, you can create any color the Amiga can display.

After you have changed the color using the slide controls, you can get the original colors back by clicking on the box labeled 'Undo' using the Left Mouse Button. Clicking on the Undo gadget again brings the changes back. If you click on the gadget labeled 'Reset', ALL changes you make to the colors will be undone. No matter how many changes you made, 'Reset' brings back the original colors. 'Undo' only undoes the last change made.

The gadgets on the right-hand side of the Palette, labeled 'Copy', 'Exch', 'Swap', and 'Sprd', allow you to do some simple editing of the colors used by an image. These operations are of the 'pick two colors' variety; you select a color as previously described, click on one of these gadgets, then select a second color. For instance, select some color from the Color Bar. Now click on the 'Copy' gadget. The title bar of the Palette window will prompt you to 'Pick color to Copy to:'. Now select a second color, different than the first one you selected. Flash! The Palette copies the first color selected to the second one, instantly. Now click on the 'Undo' gadget. You have the original two colors back.

The gadget labeled 'Exch' allows you exchange two colors, and works just like the Copy operation did. Try an exchange. Notice how the image changed color? Click 'Undo' or 'Reset' now to get the old colors back. 'Swap' is very similar; the two colors selected are exchanged, however, the image is re-colored so that although the colors have been exchanged, the image looks the same!

There are other interesting features of the Palette window we could try, but that is what the Reference Section is for. For now, click on 'Reset' to restore the original colors. Now click on the CLOSEWINDOW box in the extreme upper left corner of the Palette window (or press the ESC key on the keyboard). The Palette will disappear, and we are ready to move on to the next part of the tutorial!

T3.2 Using the Color Bias Window:

After playing with the Palette window, you have a good idea of how to adjust individual colors in an image.

PIXmate has a much more powerful color control system that allows you to adjust ALL the colors in the ColorMap simultaneously!

Do you still have the image of Abe there? Good. Select 'Color Bias' from the Color Menu (or press the 'b' key). After a second (while PIXmate does a calculation), the Color Bias window will appear.

Using the Color Bias window is very similar to using the Red-Green-Blue slide controls in the Palette window. You will notice that there are six slide controls. The ones on the left, labeled 'C', 'S', and 'I' at the top, are the Contrast, Saturation, and Intensity controls, respectively. Position the mouse pointer over the small knob in the Contrast control, then press the Left Mouse Button down. While holding the button, slowly slide the mouse up and down -- as you can see, the contrast control has a wide range of effect! Now that you have the idea, click on the 'Undo' gadget at the bottom left of the Color Bias window. The Contrast knob will be centered, and any changes will be undone. You can press the Right Mouse Button to hide the window and see the full image for as long as the button is down -- keep this trick in mind since nearly all PIXmate windows follow this rule.

Try the other slide controls. The Saturation control makes colors richer or more pastel. The Intensity control works like a brightness knob on a television. The Red, Green, and Blue slides allow you to adjust the color balance. In general, it is helpful to think of these controls as the type of knobs you find on a television to adjust the picture.

After you have explored the possibilities, click on the 'Undo' gadget, then close the window, either by clicking on the CLOSEWINDOW gadget in the upper left, or by pressing the ESC key.

T3.3 Reducing the Number of Colors in an Image:

Well, we have covered a lot of methods for manually adjusting colors. Now we will experiment with some of PIXmate's automatic color features!

Select 'Less Colors' from the Color Menu. The Less Colors window will appear. Notice there is a box with the number '32', followed by a cursor block. This indicates that the image is currently using 32 colors. Now, press the BACKSPACE key twice to clear out the number 32. In its place, type '16' and press RETURN.

As soon as you press RETURN, the window disappears and PIXmate goes into action. After a few moments, the image will be re-colored, using the 16 best colors out of the original 32 used by the image. Press the 'u' key a couple of times; notice that even though we are using half as many colors, the image really has not changed that much. You can bring up the Palette window to look at the new ColorMap PIXmate created.

Using the same technique, you could have specified '2' colors instead of '16'. This might be handy for producing two color images for printing. You can always undo the operation if it does not work to your liking.

Another thing to remember at this point is that you can always press the SPACEBAR in the middle of a long operation (long for PIXmate, that is). This will usually stop the process, and do an 'Undo' for you.

At this time, get back the original image of Abe, either using 'Undo Changes', or by re-loading the image from disk.

T3.4 Extracting Colors from Images:

For image processing or printing purposes, it is desirable to deal with just the red, green, or blue components of an image. As you may have noticed when using the Palette and Color Bias slide controls, all colors on the Amiga can be described by a combination of red, green, and blue colors. PIXmate allows you to extract one or more of these color components from an image.

With Abe on the screen, press and hold the Right Mouse Button, then slide the pointer down the Color Menu until you get to the menu item labeled 'Extract...'. When you get to the 'Extract...' item, notice that a new menu appears slightly to the right of the Extract item. This is called a submenu. Extract has nine submenu items, with names like 'RGB', 'Red', 'Green', 'Blue', etcetera. With the right button still down, slide the mouse to the right, into the submenu area, then down the submenu list until the label 'Green' is highlighted. Now, release the button. The image will turn green, and after a few seconds of wild color activity, a green version of Abe will be left on the screen! PIXmate has extracted the green component of the image. Bring up the Palette window; notice how all the colors are shades of green, ordered from darkest to lightest. Close the Palette window, and 'Undo Changes'. The original full color image of Abe is restored.

Don't worry about the other extractions right now, we just wanted you to be acquainted with this process. PIXmate uses this technique extensively to work with full color images.

The Reference Section goes into great detail about the other 'Extract...' options.

T4.0 Introduction to the Display Control Window

There are lots of other options in the Color Menu, but it is beyond the scope of this 'short' tutorial to cover them here. Use the Reference Section to explore these other possibilities. For now, we want you to have the the original Abe image back on the Current Screen so that we can explain some of the options in the Effects Menu.

Got Abe back? Okay, now select 'Display' from the Effects Menu, or press the 'd' key. The Display Control window will appear.

The Display Control window is covered with a variety of gadgets. We won't go into all of these; lets concentrate on the gadgets on the right of the Display Control Window for now.

Click on the gadget labeled 'Thinner' and zip!! -- the image is made half as wide. Click on the 'UNDO!' gadget to get the full width image back. Now click on 'Shorter'. Abe becomes half as tall. Click on 'UNDO!' again. Now click on 'Flip Y'. In a flash, Abe is upside-down. Click 'Flip X'. A mirror image is produced. Isn't this fun? By now, you can probably guess what the 'Wider' and 'Taller' gadgets do. Experiment with these six gadgets a bit.

Now turn your attention to the right-hand side of the Display Control window. Under the label 'PLANES' are a row of six little boxes, numbered one through six. The first five of these boxes are highlighted, indicating they are 'ON'. Position the pointer over the one labeled '3', then click the Left Mouse Button. The box will become un-highlighted, and some of the color will disappear from the image. Now click on '3' again. The gadget is highlighted again, and the colors are restored to the image. Congratulations, you have just performed the technique known as 'dropping a bitplane'!

Well, we could spend hours here, but we have much more to cover elsewhere in PIXmate. Close the Display Control window by clicking on the CLOSEWINDOW gadget, or by pressing the ESC key. Get the original tutorial image back; either by 'Undo Changes', or by re-loading the image if you have made too many changes to it.

T5.0 Introduction to the Image Processor

Now to explore the heart of PIXmate, the Image Processor. After you get the original Abe image back on the screen, select 'Image Process' from the Effects Menu (or press the 'i' key).

The Image Processor window will appear before you. The Image Processor has a couple of dozen gadgets that control various effects PIXmate can produce. These gadgets are grouped by function; a thin border separates the different groups of gadgets. Basically, these controls fall into three main groups: Logical Operations, Pixel Operations, and Matrix Operations. We will investigate examples of each of these operations.

T5.1 Logical Operations:

On the left of the Image Processor window, there is a group of seven gadgets, the largest of which is labeled 'LOGIC'. Below the 'LOGIC' gadget are six smaller gadgets that allow you to choose a variety of logical operations. Currently, the one labeled 'NOP' (short for No-Operation) is highlighted. Position the mouse pointer over the one labeled 'EOR' and press the Left Mouse Button. Note that now the 'EOR' gadget is highlighted, and the 'NOP' gadget is not. This means the 'EOR' logical operation has been selected. Don't worry about what that means; at this point, click the 'LOGIC' gadget and sit back for a quick color show! PIXmate will extract the green, red, and blue components of the image, perform the 'EOR' operation on each extraction, then merge the red-green-blue images into a new color image. When the process is done, you should have a image of Abe that looks like a photographic negative. Click on 'LOGIC' again; the process will be repeated, and the negative image will be converted back to the original positive image. Isn't that exciting? Okay, now click on the 'NOP' gadget to reset the logic controls to their normal settings.

T5.2 Pixel Operations:

To the right of the logic controls is a group of eight small gadgets with enigmatic names like 'AVG' and 'USM'. This group controls the various pixel operations that PIXmate performs. For an example, click on the 'AVG' gadget. After PIXmate performs the color extraction, each of the red, green, and blue images will be averaged, after which the images are merged to produce a new image. Notice how the 'AVG' averaging operation blurs the sharp details in the image, especially the fine lines that compose Abe's face and background. Now click on the 'UNDO' gadget to get the original image back. See the difference?

Now click on the 'LCE' gadget. After color processing, the result is a sharper, more detailed image. Notice how much clearer the fine lines and details are. Click 'UNDO' and try the 'USM' gadget. 'USM' also sharpens details, but using a different technique than 'LCE' does. Click 'UNDO' and try out the 'RND', 'MF1', and 'MF2' gadgets, using 'UNDO' between the steps. These produce different 'fuzzing' or smoothing effects.

For our last pixel operation, we need to change our Processing Mode. To do this, position the mouse pointer over the gadget labeled 'AutoColor', under the 'Process' label (about the middle right-hand side of the window). Click the gadget twice; it should now read 'Mono Mode'. This means we are now using one-step processing, without the red-green-blue extraction/merge operation. Adjust the slide control at the top of the window labeled 'Thresh:' (short for threshold) until the number next to the label reads '16'; the knob should be in the middle position. Now click on the pixel operation gadget labeled 'BIN'. The image is changed to two colors. The 'Thresh:' setting determines what parts of the image become dark or light. Click 'UNDO' and try other Threshold settings. As you can see, there is a wide degree of control possible using the Threshold control.

Undo any changes you have made, and set the 'Thresh:' control back to the '0' position (i.e., all the way to the left). We are now going to examine matrix operations.

T5.3 Matrix Operations:

The last group of operations are the two matrix operations. The matrix control gadgets are located in the top left-hand part of the window, right below the title bar.

Abe should be on the screen, the Threshold setting should be '0', you should be in 'Mono Mode' to Process with. Now click on the gadget labeled 'EDG' (short for EDGE). In a few moments, PIXmate will complete the edge detection process, leaving a ghostly outline of the image. Click on 'UNDO' to restore the image. Click the 'LAP' gadget now. Every detail in the image will be greatly emphasized, similar to the effect that 'USM' had on the image, but far stronger. Click 'UNDO' again.

To the right of these two gadgets, under the 'KERNAL' label, are a set of seven small boxes with symbols in them. Currently, the box containing the '*' is highlighted; click on the box labeled '-' now. The newly selected box will be highlighted. Now click on 'LAP' again. PIXmate will now bring out all the horizontal details and edges in the image. Click 'UNDO' and then click on the 'KERNAL' box with the '4' symbol. Now try 'LAP' again. See the difference? Now only the vertical edges are enhanced. The little symbols represent a tiny picture of the type of details that kernel selection will affect most.

We have only scraped the surface of the what PIXmate can do; there are thousands of possible effects. You have successfully completed the Tutorial Section, and are ready to use the Reference Section, which covers all operations in detail. Use of the 'Undo' feature, combined with experimentation is your best guide to successful image processing.

R1.0 Image File Management

PIXmate can read and write several different formats of image files, which are stored on disk or in RAM. Files are organized by pathname and filename.

R1.0.1 Pathnames and Filenames:

AmigaDOS and PIXmate use pathnames and filenames to locate a desired file. Pathname refers to the complete name of a directory or subdirectory where files are stored. A filename is the actual name of a file stored in the directory specified by the pathname. The full name for a file is the combination of pathname and filename. For instance, a file named 'Bill' stored on a disk in drive DF0: would have a full name of 'DF0:Bill'. The pathname would be 'DF0:', and the filename would be 'Bill'. If the file 'Bill' was located in a directory on DF0: named 'Pictures', the full name would be 'DF0:Pictures/Bill', the pathname would be 'DF0:Pictures', the directory name would be 'Pictures', and the filename would be 'Bill'. For further details, see the chapter 1.3 of the AmigaDOS User's Manual.

R1.0.2 Legal Names:

Filenames and names of subdirectories must be 30 characters or less. For convenience, avoid using the characters '*', '?', '-', '/', and ':' in the names you choose for files, since these characters have special meanings to PIXmate and AmigaDOS (see Wildcards). Also, we recommend that you avoid using spaces or control characters in filenames, (e.g., 'The Picture'), since this makes it difficult to type the filename later from the AmigaDOS CLI environment.

R1.0.3 Wildcards in Names:

PIXmate and the File Selector allow the use of the symbols '*' and '?' in a filename to refer to several filenames in a directory. These symbols, commonly referred to as wildcards, universally match characters or series of characters in a filename using a pattern-matching technique. The '*' character matches any series of characters. The '?' character matches any single character. For example, suppose the following filenames are in a directory named 'DF0:Pictures':

```
Fred.HIRES  
Joe.LORES  
Pete.HIRES  
Ted.HIRES.R  
Tom.LORES.G  
testfile
```

Figure R.1.1
Anatomy of the Path-Master(tm) File Selector

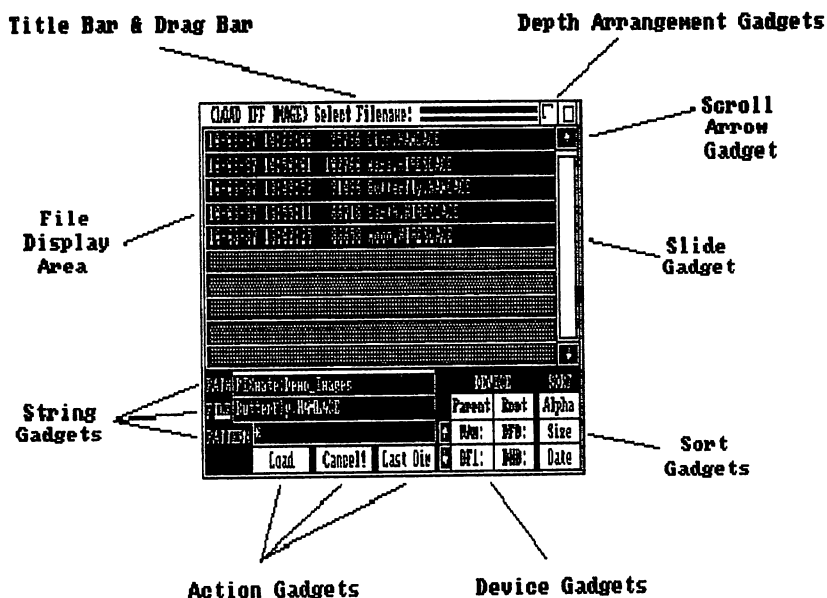


Figure R1.1 Anatomy of the Path-Master(tm) File Selector

A single '*' pattern would match all of the above filenames. The pattern '*.HIRES' would match only filenames that end with '.HIRES', in this case just the filenames 'Fred.HIRES' and 'Pete.HIRES'. The pattern 'T*' would match any filename starting with the letter 'T' 'Ted.HIRES.R', 'Tom.LORES.G', and 'testfile'. The pattern '*LORES*' would match any filename that has the string (character sequence) 'LORES' in it somewhere, 'Joe.LORES' and 'Tom.LORES.G' in this case. The pattern '*.?' would match any string that ends with a period followed by a single character; 'Ted.HIRES.R' and 'Tom.LORES.G' are candidates. The pattern '*.*.?' would match any string that contains two periods; thus 'Ted.HIRES.R' and 'Tom.LORES.G' would match. Finally, the string '????????' would match any filename that has exactly eight characters, in this example 'testfile' is the only match.

R1.1 Using the PIXmate File Selector

PIXmate uses the Path-Master(tm) File Selector, which is the primary way files are selected after PIXmate has begun execution. You use the File Selector to select a pathname and filename for the file you wish to load, save, or delete. The File Selector dynamically time-slices its operations, so you are never forced to wait for a directory to be read.

When PIXmate requires a filename to complete an operation, such as loading, saving, or deleting a file, the File Selector window will pop up on the WorkBench screen (see Fig. R1.1), using your default WorkBench resolution and colors as set by Preferences. This guarantees that the File Selector will always be same resolution and colors that you selected for your WorkBench, regardless of the resolution or colors PIXmate is using for your current image.

The File Selector reads your current directory (or directory where PIXmate is located if you are using the WorkBench) the first time it is used. The File Selector keeps track of its current information between uses, so it never has to re-read a directory unless the directory has changed. Also, if you are finished using the File Selector before it has a chance to read all the entries in the currently selected directory, the File Selector will pick up where it left off reading next time you use the File Selector.

NOTE: You should never remove a disk from a drive when the drive-activity light is on! Removing a disk while it is spinning can scramble any information on the disk and possibly cause damage to your drive. It is a good idea to wait about five seconds after the light has extinguished before removing a disk, to let AmigaDOS validate the disk if it needs to.

If the drive-activity light does not go out after a reasonable period of time, and the keyboard and mouse are unresponsive ('locked up' is the jargon for this condition), it is possible the Amiga operation system has crashed or 'hung'. The safest way to reset the computer and drives is to press the CTRL-Left Amiga-Right Amiga combination of keys to force a warm boot.

Figure R1.1 shows what the File Selector window looks like, and names the parts of the File Selector discussed in the next few sections.

R1.1.1 Title Bar and Depth Arrangement Gadgets:

The Title Bar of the File Selector serves three purposes: it prompts you for action, reports the current status of the File Selector, and can be used as a drag bar for positioning the File Selector on the WorkBench screen.

The text on the left of the Title Bar, inside of the ' ' symbols, is a reminder and prompt to complete the currently selected PIXmate operation. For example, if you had selected 'Delete File' from the PIXmate Project Menu, the File Selector Title Bar prompt would read 'DELETE FILE '.

To the right of the prompt area, the current status of the File Selector is shown. The two most common status messages are 'Reading...', which means that the File Selector is still reading filenames from the directory, or 'Select Filename:', which informs you that the File Selector has read all the entires available from the current directory. The status area is also used for displaying any problems or errors encountered while reading a directory or changing paths. For instance, if you select a pathname for a directory that does not exist, the status area will read 'Path not Found!'. If you remove the disk or change paths to a disk drive with no disk present, the status area will read 'No disk in drive!' or 'Volume not available!'. If you select a path for a directory that contains no files, the status message will read 'Empty Directory!'.

On the top-right corner of the Title Bar are the two Depth Arrangement Gadgets. You can stack other WorkBench windows on top of the File Selector with the left depth gadget, or bring the File Selector window to the top of the stack by clicking on the right depth gadget.

You can click-hold on the Title Bar with the Left Mouse Button anywhere to the left of the Depth Arrangement Gadgets, and then drag the File Selector window around the WorkBench screen, just like other Intuition windows.

R1.1.2 File Display Area:

The File Display Area gives you information on files and subdirectories the current directory contains. You can select filenames or display subdirectories from the File Display Area by clicking inside the rectangle that surrounds the desired entry.

There is room to display ten file or directory entries at a time in the File Display Area. If there are less than ten files or directories available in the current path, unused areas of the Display Area will be filled with a checkerboard pattern. Furthermore, if there are no files available, the Title Bar will inform you of the reason with a status area message.

For each entry, the following information fields are supplied. First, the date of creation, in month-day-year format(MM-DD-YY). Second, the time of creation, in hours-minutes-second format (HH-MM-SS). Third, the size of the file entry in bytes, or if the entry is a directory, the word 'DIR'. Directory entries are easy to recognize, since they are a different color than file entries. The fourth field is the file or directory name itself.

Clicking once with the Left Mouse Button on a file entry in the File Display Area will copy that entry's filename into the File String Gadget. Clicking twice in quick succession on a file entry (double-clicking) will select that filename as your final choice and return you to PIXmate. This is the equivalent of clicking once on a file entry, then clicking on the Select Gadget.

If you click on a directory entry (i.e., entries labeled 'DIR'), the File Selector will append that directory name to the current pathname, and then display any entries available from that subdirectory.

R1.1.3 Scroll and Slide Gadgets:

If there are more entries in a directory than will fit in the ten entry File Display Area, the three Scroll Gadgets to the right of the File Display Area can be used to move up and down the list. Clicking once on the up or down arrow gadgets with the Left Mouse Button scrolls the list up or down one entry. Holding the mouse button down for a moment on an arrow starts the auto-repeat feature, scrolling through the list at about ten entries per second for as long as the button remains depressed.

Between the two arrow gadgets is a slide gadget that serves three functions. The vertical size of the slide knob gives you an estimate of what percentage of entries out of the total entries are visible in the File Display Area. Thus, if there are ten or less entries, the slide knob will fill the entire slide gadget rectangle; if there were twenty entries, the knob would occupy half of the slide gadget area. The position of the knob tells you what part in the list you are displaying; if the knob is at the top of the container you are at the top of the list of entries.

You can click-hold the slide knob with the Left Mouse Button, and drag the knob up and down. By clicking inside the container above or below the knob, you can jump nine entries in either direction each click.

Due to the dynamic nature of the File Selector, if you try to move the knob while entries are still being read from the directory, the slide gadget may resist your attempts to position it. Using the arrow gadgets instead will result in less conflict during directory reads.

R1.1.4 String Gadgets:

Below the File Display Area are the three string gadgets, labeled 'PATH', 'FILE', and 'PATTERN'. You click using the Left Mouse Button anywhere inside of the rectangle to the right of the label to activate a string gadget. A cursor will appear inside the rectangle to indicate that the gadget is ready for you to type in information from the keyboard. When you press RETURN, your typed information is processed.

The string gadgets use standard Intuition rules and shortcuts for line editing inside the gadget. The left and right arrow keys allow you to position the cursor over a character. Holding down the SHIFT key while pressing the left and right arrows jump the cursor to the beginning and end of the string. Pressing the Right-Amiga-x will clear the contents of the string gadget, and Right-Amiga-q will undo the previous change. Pressing the DEL (delete) key removes the character under the cursor, and the BACKSPACE key removes the character to the left of the cursor.

Note that you must press RETURN to actually finish a string entry; if you click the mouse elsewhere before pressing RETURN, the original string will be restored unchanged. The cursor disappears when you press RETURN, signaling a finished entry.

The Path String gadget shows the pathname to the directory the File Selector is displaying in the File Display Area. Typing in a different pathname and pressing RETURN will cause the File Selector to display entries in the new directory. Pathnames may not total more than 300 characters in length.

The File String gadget shows you the currently selected filename and allows you to type a filename into the space provided. This gadget is automatically activated and ready for typing when the File Selector is invoked by PIXmate. Pressing RETURN will select the filename in the File String gadget as your final choice and return you to PIXmate. Note that legal filenames must be at least one character, and no more than 30 characters in length. If you attempt to enter a filename more than 30 characters in length, the screen will flash to warn that no further characters may be entered. As a convenience, if you enter a filename such as 'DF1:testfile', the File Selector will divide the name into a pathname and filename automatically. Thus, the new pathname would be 'DF1:' and the new filename would be 'testfile'.

The Pattern String Gadget shows the current pattern that filenames in the File Display Area are filtered through before display. Directory names are always visible regardless of the pattern selected. Normally, the string area will contain the '*' wildcard character, which matches all filenames. You can type a new filter pattern into the string area and the File Selector will instantly update the File Display Area, showing you only filenames that match the new pattern. See the section on Wildcard Names for information on legal pattern combinations. Note that this version of the File Selector supports a maximum of eight levels of pattern abstraction when expanding the '*' character in patterns; thus, patterns more complicated than '*.*.*.*.*.*.*.*' will not be processed. Filenames should be 30 characters or less. Additionally, if you specify a pattern and none of the available filenames match the new pattern, the Title Bar will alert you with the status message 'Pattern not found!'.

R1.1.5 Action Gadgets:

The three Action Gadgets below the String Gadgets allow you to select a filename and return to PIXmate, cancel file selection operations, or undo the last path change made.

The leftmost of the three gadgets, called the Select Gadget, is used to confirm that the filename visible in the File String Gadget is the filename you want PIXmate to use. The Select Gadget has no effect until a filename is put in the File String Gadget. If a filename is available, the current PIXmate operation will be completed using that filename. The Select Gadget has three possible labels: 'Load', 'Save', or 'Delete', depending on the PIXmate operation in progress. This matches the prompt in the File Selector Title Bar, and reminds you which operation is to be performed. The middle Action Gadget, labeled 'Cancel!', allows you to exit the File Selector and abort the current operation. Note that you can hit 'Cancel!' before the File Selector has finished reading a directory, immediately returning you to PIXmate.

The rightmost Action Gadget, labeled 'Last Dir', toggles between the last pathname used in the File Selector and the current pathname. This can be a convenient way to switch between two commonly used directories; by selecting the first pathname, then selecting the second pathname, you can use the 'Last Dir' gadget to jump from one to the other.

R1.1.6 Device Gadgets:

The six Device Gadgets allow you to quickly switch to different directories and logical devices in AmigaDOS. Clicking on these gadgets will immediately cause a path change and force the File Selector to read the new directory.

The 'Parent' gadget moves you one directory closer to the top (root) of a directory structure, i.e., the pathname is shortened by one directory name. For example, if your current pathname was 'PIXmate:Pictures/Hires', clicking on the parent gadget would change your pathname to 'DF0:Pictures'. Clicking on the gadget again would change the pathname to 'DF0:'. Further clicks would simply re-read drive DF0:. The 'Root' gadget moves you directly to the topmost directory of a directory structure, in this case, 'DF0:'.

Below the parent and root gadgets are the four logical device gadgets. The File Selector automatically labels these four gadgets with the first four logical devices found in the AmigaDOS filing system. All Amigas currently have the 'RAM:' and 'DF0:' logical devices available to them. If you do not have an external disk drive or hard disk, the bottom two device gadgets will be disabled and labeled 'NIL:', since they are unused. Otherwise these gadgets will be labeled with the other available logical device names present on your Amiga. If you have more than four logical devices, (e.g., several disk drives, hard disk partitions, recoverable ram disks, etc.) the two small arrow gadgets to the left of the four device gadgets allow you to move through the list of available device names. No matter how many devices you have, the File Selector will allow you to select the device you want.

Note that although it is frowned upon, AmigaDOS allows device names to be more than the normal three characters in length (e.g., 'DF1' or 'RAM'). If a device name on the system is more than three characters long, only the first four characters of the name will be displayed on the device gadget label. However, the File Selector uses the full device name when changing pathnames.

R1.1.7 Sort Gadgets:

The three Sort Gadgets allow you to organize the information in the File Display Area three different ways. The 'Alpha' gadget alphabetizes the directory list, ignoring case differences. The 'Size' gadget sorts the entries by file size, shortest file first. The 'Date' gadget sorts the entries by time of creation, oldest entry first. To separate the directory names from the filenames in a directory, first sort them using 'Alpha', then using 'Size'. All the directory names will be at the top of the list, sorted alphabetically.

Note that the amount of time it takes to sort the entries is proportional to the number of entries in the list. It can take a few seconds to sort a directory with several hundred entries.

Project Menu

R1.2 Using Interchange File Format (IFF) Image Files

PIXmate fully supports the 'ILBM' (InterLeavedBitMap) Interchange File Format for storing raster images as put forth in the EA (Electronic Arts) IFF 85 standard and the EA IFF 86 amendments. IFF is a quick, versatile, and portable file format most Amiga programs that deal with images use to store their data.

An ILBM is an IFF data chunk that can be part of a larger, more complex IFF file, such as used by an animation package, or may exist by itself, like the files created by a paint program.

Each ILBM contains smaller data chunks that describe the width and height, graphics modes, colors, cycling information, and actual bitmap data for an image. An ILBM does not have to have all these properties, and you do not have to use all the information contained by an ILBM. This allows you to save the colors of an image without forcing you to save the bitmap data, and to read just the color data from an ILBM while ignoring irrelevant data.

For further information on IFF files, see Appendix H of the Amiga ROM Kernal Manual Volume 2, or obtain a copy of the Fred Fish Public Domain Library Disk -64.

R1.2.1 Loading IFF Image Files:

Selecting 'Load IFF' (keyboard shortcut Right Amiga-L) from the Project Menu will pop up the File Selector (see Using the Path-Master(tm) File Selector). Cancelling the File Selector will cancel the load IFF request. Otherwise, after selecting a filename, the requested file will be loaded into the current screen.

During the load process, the mouse pointer changes to it's 'Busy' cloud image. The WorkBench screen remains in view while the load proceeds, in order to reduce load time and obnoxious disk drive noises when loading HIRES images.

As soon as the load completes, the new image will pop up on the current PIXmate screen. Note that loading a new image replaces the previous image PIXmate was displaying, and if it is a different resolution, will discard your Undo Buffer (see Undo Changes). You should save your current image or copy it to the Other Screen before loading a new image if you wish to keep it.

Of course, there are several possible errors that could occur when loading an image file. The file may not be an IFF file, or it may be unreadable by PIXmate, or AmigaDOS may detect an error on the disk, or you may not have enough RAM to load the image. If a problem is detected and PIXmate cannot load the selected IFF image, a PIXmate Requester will pop up informing you of the exact cause of the error. Your current screen will be left unchanged if possible. Refer to Appendix B for an explanation of messages and their meanings.

R1.2.2 Saving IFF Image Files:

Selecting 'Save IFF' (keyboard shortcut Right Amiga-S) from the Project Menu works much like loading IFF images. The current PIXmate screen is saved using the pathname and filename you specify with the File Selector. As with 'Load IFF', the save operation can be cancelled from the File Selector by clicking on 'Cancel!'.

Many of the same possible problems mentioned in the section on loading IFF images apply to saving images, in addition to the possibility of getting a 'Disk Write Protected' or 'Disk Full!' message from the WorkBench. PIXmate will abort a save operation if a non-recoverable problem develops, leaving any partially written file intact. You can then decide whether to use 'Delete' from the Project Menu to remove the partial file, or, in the case of a corrupted disk, change to a different disk without further disruption of the offending disk. See Appendix B for possible error messages.

R1.2.3 IFF Image File Compression:

The 'Compress...' Project Menu options allow you to turn on or off IFF file compression when saving images in the IFF format. Normally, you would want to leave compression set to it's default 'On' selection. This typically reduces the size of your image files between 20 and 30 percent. When you select 'Off', no compression of image data is done, resulting in larger files but faster load and save operations, since no encoding/decoding time is necessary.

This is particularly noticeable when working with files in RAM.

R1.3 Using Other File Formats

In addition to loading and saving images as IFF files, PIXmate supports several other file formats. These are selected from submenu items under the 'Read...' and 'Write...' sections of the Project Menu. Use the File Selector to prompt you for a filename, and cancelled from within the File Selector.

The same possible problems outlined in the previous sections on loading and saving IFF files apply to using other file formats. Refer to Appendix B for error messages.

R1.3.1 Reading and Writing IFF Palettes:

The Read and Write Palette operations allow you to load or save just the color information for an image in IFF format. If you use Read Palette on an IFF file, the current screen colors and color cycling information will be replaced with the information from the selected file. The Write Palette option will save the current color information in IFF format under the filename you select. You can then use Read Palette to use the same color information later with other images. Since only the color information is saved, the files are short and palette file operations complete quickly.

For convenience, palettes are saved in a format compatible with other programs that support brushes or similar images smaller than the screen.

R1.3.2 Reading and Writing Raw Image Formats:

Raw format is a fast, simple way to store image and color data for later use. The file consists of a binary ascii dump of each bitplane in the bitmap using a left to right, top to bottom scan, followed by the current RGB color settings stored as 16 bit words. Unlike IFF files, no data is stored concerning the size of the bitmaps, graphics modes, or color cycling settings. When reading raw format files, PIXmate uses your current screen to determine these settings. You can use the Display Control window to format the screen and change the graphics modes to match different raw format files before you load them, assuming you know what format they were saved as.

Using the Write Raw Format option will dump the current screen bitmap and ColorMap using the selected filename. It is recommended that you follow some sort of naming convention that will remind you what format the screen was in when you write a file in raw format.

Use a combination of Read and Write Raw Format to make quick backup copies of a screen into RAM, since saving even HIRES-LACE images takes only a seconds. Also, raw format may prove more convenient for use in custom applications that do not require or support the IFF standard.

R1.3.3 Reading Old-Style Digi-View Image Files:

The earliest versions of NewTek's Digi-View(tm) digitizer software did not support the IFF standard. The LORES HAM images it produced were saved in a modified raw format. This option allows you to load and display files of this nature. You can then save them as IFF files for easier use. Note that this option is for backward compatibility with existing image files, since later versions of the Digi-View software use IFF format.

R1.3.4 Reading Atari Neochrome Image Files:

The Read Neochrome option allows you to load and display files that use the Atari Neochrome(tm) file format. This may be useful if you have access to image files created on the Atari 520ST or 1040ST computers, and can transfer them to the Amiga. Note that the Atari currently has one color graphics resolution, 320 by 200 pixels, with a maximum of 16 colors on screen simultaneously out of a palette of 512 possible colors. This corresponds to the Amiga LORES graphics mode, using three bitplanes, and with half as many monochrome shades of color as normal, i.e., only eight possible intensities of red, green, and blue, instead of sixteen. PIXmate does not have a Write Neochrome option, since it is unlikely that you would want to reduce the color capabilities of your Amiga or limit yourself to a single image size when saving files. However, if you must transfer Amiga images to Neochrome format, PIXmate can help by formatting the Amiga image to 320 by 200, selecting the best sixteen colors using Less Colors, then using Save IFF to put the image in IFF format. Public-domain programs exist that convert IFF to Neochrome format.

R1.4 Deleting Files

Selecting 'Delete' (keyboard shortcut Right Amiga-D) from the Project Menu allows you to discard files selected with the File Selector. As with other operations involving the File Selector, you can abort the delete operation by clicking 'Cancel!' from within the File Selector. If you do select a file for deletion, a PIXmate Requester will pop up to confirm your decision, giving you a last opportunity to preserve the file.

Once a file has been deleted, it is usually impossible to get it back, so caution is suggested when deleting files. See Appendix B for other possible problems and their diagnostics.

R1.5 Using Multiple Filenames

In addition to working with individual files, PIXmate allows you to select several filenames for loading in batch mode. You can specify these filename from the WorkBench icon-based environment, or the AmigaDOS CLI when you first load PIXmate, or by using the File Selector after PIXmate has loaded.

R1.5.1 Specifying Multiple Filenames:

When using the WorkBench to pass filenames to PIXmate when it loads, you hold down the SHIFT key on the keyboard, then click once on each image file icon you want to load, then double-click on the PIXmate icon (you can let up on the SHIFT key now). When PIXmate finishes loading, it will display files associated with the icons you selected, and allow you to easily switch from file to file.

Selecting multiple filenames from the CLI environment, you can type 'PIXmate' or 'run PIXmate', followed by a filename or series of filenames separated by spaces. You can use wildcards in your filenames (see the section on Wildcard Names) to select all the files in a directory; for instance, typing 'PIXmate *' will select all the filenames in your current working directory for examination, while typing 'PIXmate DF1:Pictures/*' would select all the filenames in the directory 'Pictures' contained on disk drive 'DF1:'. Note that when using the CLI, you must use full pathnames when referring to directories and subdirectories. If you specify a filename that cannot be found, PIXmate will let you know.

To select several filenames with the File Selector, you enter a wildcard name in the File String Gadget and press RETURN. Any filenames that match the wildcard pattern will be selected. This technique can be used with Load IFF, and any of the Read operations. PIXmate will not allow you to delete or save files using wildcard filenames.

PIXmate only accepts images in IFF format when selecting files before PIXmate has loaded, or when specifying several filenames in conjunction with Load IFF. Thus, PIXmate will automatically skip any files that are not in IFF format, and eliminate them from the list of filenames you specify. This allows you to quickly scan a directory full of files for viewable images without resorting to trial and error. To scan for other formats you can use the Read and Write options from the Project Menu after PIXmate has loaded (see also 'Using Other Image File Formats').

R1.5.2 Working with the Previous File:

Selecting the 'Previous' (keyboard shortcut Right Amiga-P) file option from the Project Menu loads the previous image file in the list of filenames you specified. If there is no previous file available in the file list, the Screen Title Bar message reads 'No Previous File'.

R1.5.3 Working with the Next File:

Selecting the 'Next' (keyboard shortcut Right Amiga-N) file option from the Project Menu will load the next available image file in the current file list. When there is no next file available, the Screen Title Bar will flash the message 'No Next File'.

By using a combination of 'Previous' and 'Next' with a list of files, PIXmate can function as a simple slide show viewer. Or, you could use this technique to work on a batch of files all related to a single project, assuming that you named the files using a character sequence common to other files in the project. In addition, since PIXmate remembers which Project Menu option you selected to create the list, you can save a collection of your favorite palettes in a directory, then later read them in quick succession using Read Palette and a wildcard filename.

R1.6 Quitting PIXmate

Selecting the 'Quit' option (keyboard shortcut Right Amiga-Q) from the Project Menu tells PIXmate to unlock and de-allocate all the system resources it has used and finish execution. If you have made changes to the image on either of the PIXmate screens and wish to keep a copy, you should use Save IFF before you select Quit.

An alternate way to quit PIXmate is to click on the CLOSEWINDOW gadget of the small window titled 'PIX' on the upper right of the WorkBench screen. This method is also useful if you want to shut down PIXmate in a hurry, even in the middle of an lengthy operation or when using the File Selector.

Edit Menu

R2.1 Operations Using the Undo Buffer

Most operations in PIXmate that alter the current screen can be undone by selecting the 'Undo Changes' option (keyboard shortcut 'u') from the Edit Menu.

R2.1.1 Undo Features and Limitations:

Whenever you perform an operation in PIXmate that modifies an existing image, PIXmate automatically attempts to create an Undo Buffer and save the current screen and colors. When you select Undo Changes, the previous image is exchanged with the current image. By repeatedly selecting Undo, you can toggle between the changed and unchanged versions of an image. This is useful for deciding whether the last processing operation was an improvement or a mistake. Of course, you can quickly save your image at intermediate steps and go back to them later if you want to try a different technique.

PIXmate may be unable to allocate enough CHIP RAM to create the Undo Buffer in some circumstances. You will receive a PIXmate Requester giving you a choice as to whether you wish to disable the Undo feature temporarily, or completely cancel the operation in progress. Also, if you replace the current screen by loading a new image with a different width or height, or by formatting the image differently (see 'The Display Control Window' section), the Undo Buffer will be reallocated to match the current screen dimensions.

R2.1.2 Killing the Undo Buffer:

When you are low on available CHIP RAM, you may be unable to perform an operation involving the Other screen. You can free the RAM used by the Undo Buffer by selecting 'Kill Undo Buffer' from the Edit Menu. This may give you enough RAM to successfully perform an operation after a second try. PIXmate will automatically recreate the Undo Buffer when enough RAM becomes available to allocate one, unless you disable the Undo feature.

R2.1.3 Disabling the Undo Feature

When you select the 'Disable Undo' option from the Edit Menu, you kill the existing Undo Buffer, if any, and prevent PIXmate from automatically recreating the Undo Buffer the next time you perform an operation that would change the image. The Undo feature remains disabled until you select 'Undo Changes' or press the 'u' key. This signals PIXmate that you wish to start using the automatic Undo feature again.

Note that some operations require the Undo Buffer for temporary use; these operations have priority over the Disable Undo request.

R2.2 Operations Involving the Current Screen

PIXmate offers a variety of options under the Edit Menu that affect the display and position of the Current screen.

R2.2.1 Disabling the Screen Title Bar:

By selecting the 'Toggle Title' (keyboard shortcut 't') option from the Edit Menu, you can hide the Title Bar at the top of the screen, revealing any parts of the image that may be obscured by it. Selecting Toggle Title again will bring the Title Bar back into view.

R2.2.2 Disabling the Pointer Sprite:

If you select 'Toggle Sprite' (keyboard shortcut 's') from the Edit Menu, you can hide the pointer crosshairs used by PIXmate for mouse positioning. This may be useful if you want to take photographs directly from the monitor screen, or save your images to a video recorder without having the pointer visible in the picture.

Selecting Toggle Sprite again will restore the pointer to visibility.

R2.2.3 Clearing the Screen:

Selecting 'Clear Screen' (keyboard shortcut 'x') from the Edit Menu will clear the screen to color zero, erasing any image that may have been visible. You can use Undo Changes to get back the image if you accidentally clear the screen.

R2.2.4 Clearing Part of the Screen:

Choosing 'Clear Area' (keyboard shortcut Right Amiga-X) from the Edit Menu allows you to selectively clear a rectangular area (a 'clip') of the screen. When Clear Area is selected, the pointer will change to a larger set of crosshairs to let you know that you are in Clip Mode. You position the crosshairs at the upper left of the rectangle you wish to clear, then click-hold the Left Mouse Button and drag the crosshairs to the bottom right corner of area to be cleared. When you release the Left Mouse Button, the selected Clip will be filled with color zero.

At any time before you release the Left Mouse Button, you can press the SPACEBAR or press the Right Mouse Button to abort the clip operation. After the Clear Area operation has completed, you can Undo Changes if you are displeased by the results.

R2.2.5 Moving and Centering the Screen:

When working with overscanned images, it may be necessary to position the image in the center of the screen. The Edit Menu option 'ReCenter' (keyboard shortcut 'r') computes the exact center of an overscanned image, and positions the screen so that the center of the image is in the center of the screen. Selecting ReCenter again or pressing the Right Mouse Button returns the image to its default screen position.

The four cursor arrow keys can be used to smoothly move the image about forty pixels in any direction, giving you manual control over image positioning.

R2.2.6 Moving the Image on the Screen

The four cursor arrow keys in conjunction with the Right SHIFT key can be used to push the image around the screen in a desired direction. Holding the Right SHIFT key down and pressing an arrow key once will push the image one pixel in the direction pointed to by the arrow. Holding down the combination of keys will auto-repeat the motion, moving four pixels at a time.

By pressing the Right ALT key in combination with an arrow key causes the image to jump half its width or height in the direction pointed to by the arrow key. This is useful when you are working with half-sized or quarter-sized image sections created using the Display Control window, and want to move the sections around the screen quickly.

Note that any parts of the image that fall off the edge of the screen are permanently lost. Due to the flexible, repetitive nature of this operation, it is not possible to save the screen in the Undo Buffer before the screen is shifted. You should save copies of your work before attempting to move the image.

R2.3 Operations Involving the Other Screen

PIXmate has two totally independent screens that you can use for viewing and processing images. The screens can have different sizes, graphics modes, and color information, and some operations achieve special effects by combining information from each screen. You can use the Other screen as an extra Undo Buffer, and keep spare copies of an image there. References to the two screens are completely interchangeable; the screen you are looking at is the Current screen, the screen you cannot see is considered the Other screen for all operations.

R2.3.1 Flipping to the Other Screen:

Selecting 'Flip to Other' (keyboard shortcut 'f') from the Edit Menu will exchange the Current screen with the Other screen. If no Other screen exists, PIXmate attempts to create one using the same dimensions as the Current screen, then performs the Flip to Other function if the allocation succeeds. The default Screen Title Bar for the new screen will read 'Other Screen' to remind you of its origin. If the allocation fails due to lack of CHIP RAM, you will get a PIXmate Requester explaining the difficulty. You might have enough RAM if you 'Disable Undo' from the Edit Menu before you attempt to use the Other screen.

By holding down the 'f' key, you can repeatedly flip back and forth between the two screens. The exact speed is determined by the keyboard auto-repeat speed you select using Preferences from the WorkBench disk. Selecting a fast auto-repeat speed will permit you to flip screens at a truly amazing rate.

Note that using two screens and the Undo feature with HIRES LACE images consumes an enormous amount of CHIP RAM. Worst case occurs when working with 640 by 400 pixel, 4-bitplane, 16 color images. This requires a minimum of 430,000 bytes of available CHIP RAM after PIXmate has loaded. See the section 'Working with Low RAM Conditions' for tips on maximizing your available RAM.

R2.3.2 Copying an Image to the Other Screen:

Selecting the 'Copy to Other' (keyboard shortcut 'c') from the Edit Menu makes an exact copy of the Current screen to the Other screen. Any existing image on the Other screen will be replaced by the current image. If the copy operation succeeds, the two screens will be indistinguishable from each other. If the copy fails (probably due to insufficient CHIP RAM), a PIXmate Requester will pop up explaining the problem.

R2.3.3 Copying Part of an Image to the Other Screen:

Selecting 'Clip to Other' (keyboard shortcut 'k') from the Edit Menu allows you to copy a rectangular area of the Current screen to the Other screen. When selected, the pointer will change to a larger crosshair to confirm that you are in Clip Mode. You select an area to clip using the same technique described previously in the 'Clearing Part of the Screen' section. After an area has been selected, that section of the Current screen is copied to the Other screen. Note that the two screens must have the same dimensions for Clip to Other to work. If the two screens have different dimensions, or no Other screen exists, a new Other screen will be created using the same colors and dimensions as the Current screen. When allocating a new screen, the same low CHIP RAM warnings as described in the previous sections may apply.

R2.3.4 Cutting Part of an Image to the Other Screen:

The 'Cut to Other' (keyboard shortcut Right Amiga-K) Edit Menu option is a combination of the Clip to Other and the Clear Area operations discussed in previous sections. After selecting a clip, the area is copied to the Other screen, and cleared from the Current screen in a single operation.

R2.3.5 Killing the Other Screen:

If you cannot perform an operation due to lack of CHIP RAM, you can reclaim all memory space used by the Other screen by selecting 'Kill Other Scrn' from the Edit Menu. Of course, if there is no Other screen in existence, this option will have no effect. See the section 'Working with Low RAM Conditions' for more tips.

R2.4 MultiTasking with Other Programs

Due to the multitasking capabilities of the Amiga and PIXmate's efficient use of system resources, it is possible to run several PIXmates at a time, or to use PIXmate and other programs interactively by running them simultaneously. Of course, available CHIP RAM may limit the number programs you can run at the same time.

However, you should be able to run four or five PIXmates using LORES images on an Amiga with one megabyte of total memory and no external drive, without sacrificing much performance or speed.

R2.4.1 Grabbing Another Screen:

By selecting the 'Grab Next Screen' option from the Edit Menu, you can grab a 'snapshot' of the next screen available in the Amiga operating environment. The Screen Title Bar will change to confirm that the image you are looking at is a snapshot.

If PIXmate is the only program running, then the only other screen available is the WorkBench screen, and PIXmate will grab that. If possible, PIXmate will also copy the colors used by the next screen.

PIXmate considers the next screen to be the first screen encountered behind the Current PIXmate screen. PIXmate ignores its own screens when looking for the next screen, since you can copy information using Copy to Other between PIXmate's own screens.

Note that PIXmate does not format your screen to match the next screen. Instead, PIXmate grabs only as much of the next screen as will fit on the Current screen. You can use the Display Control window to alter the screen dimensions and number of bitplanes to match another screen before using Grab Next Screen.

R2.4.2 Grabbing DeluxePaint Screens:

PIXmate has a special type of Grab Next Screen, labeled 'Grab DeluxePaint' on the Edit Menu. When you select this option, PIXmate will search the screens available in the system, ignoring non-DeluxePaint screens. If a DeluxePaint screen is found, the screen will be copied to the Current screen as described in the previous section. If no DeluxePaint screens are found, a PIXmate Requester will alert you to the problem.

This feature is handy for titling or retouching images in DeluxePaint, then quickly importing the image into PIXmate. Note that you will get an exact copy of the current DeluxePaint screen, so you should press 'F10' in DeluxePaint before using Grab DeluxePaint if you do not wish to have the DeluxePaint gadgets cluttering your screen.

Unfortunately DeluxePaint has no handy 'Grab PIXmate' feature, so to send an image to DeluxePaint you must first save the image using 'Save IFF' from the PIXmate Project Menu, then load the file from DeluxePaint using the 'Load' option from the DeluxePaint Project Menu. DeluxePaint and DeluxePaint II written by Dan Silva, are currently the premier Amiga paint programs on the market.

Color Menu

R3.1 Color Operations

The Color Menu encompasses a broad range of ways to manipulate the color information used by an image. You can adjust individual colors, cycle ranges of colors, extract and merge color information, force an image to use fewer colors, convert 4096 color HAM images to 32 color and back, match colors with another image, and much more.

R3.2 Using the Color Cycling Feature

Selecting the 'Cycle' option (keyboard shortcut TAB key) from the Color Menu turns enables color cycling. Selecting Cycle again will turn off the cycling effect. If no effect is noticed, probably no cycle ranges are selected or the cycle speed is so slow that it seems to be not cycling. You can adjust the color cycling effect using the Palette window controls. Refer to 'Adjusting Color Cycling' in the next section for more information.

R3.3 The Palette Window

Spectra-Plus(tm) Palette Window

PIXmate uses the Spectra-Plus(tm) Palette window, designed to be fast and easy to use, while covering as little of your total image area as possible. Selected from the Color Menu under the 'Palette' option (keyboard shortcut 'p'), the Palette window allows you to perform a variety of color editing functions and adjustments. The Palette window is the primary way you change individual colors used by an image, and is used to change the color cycling information associated with an image.

The Palette window has special operating conveniences that most PIXmate windows provide. Pressing the Right Mouse Button causes the Palette window and Screen Title Bar to temporarily disappear, allowing you to see the entire image. When you release the mouse button, the Palette window pops back into view. Pressing the 't' key turns the Screen Title Bar on and off. Pressing the ESC key (i.e., the escape key) closes the Palette window. This is the equivalent of clicking on the CLOSEWINDOW gadget with the Left Mouse Button. The Palette Title Bar can be used as a handle to drag the window around the screen, and PIXmate will remember the position you leave the window at and try to use that location next time the window pops up.

FIGURE R3.3 **Anatomy of the Spectra-Plus(tm) Palette Window**

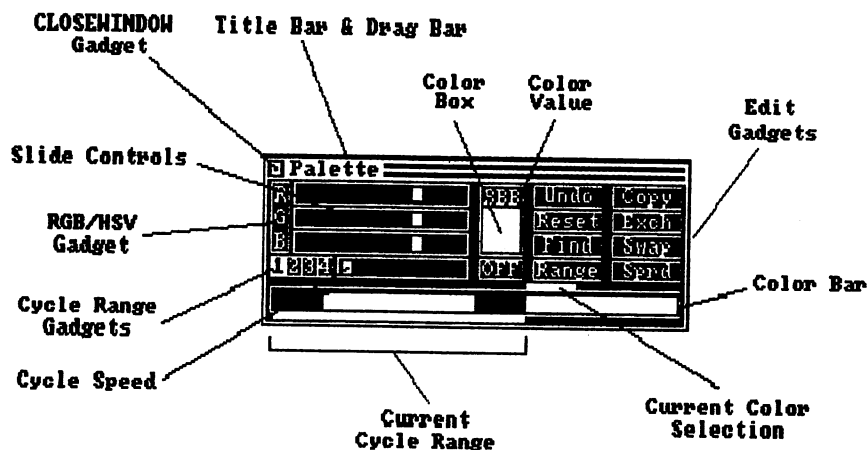


Figure R3.3 Anatomy of the Spectra-Plus(tm) Palette

The Palette uses the darkest and brightest colors available from the current ColorMap to render itself. This insures that the Palette window will always be easy to read, without affecting the image colors. However, if all the colors in the ColorMap are identical, the Palette window may invisibly blend itself into the background. If this is the case, you can press the SPACEBAR key to temporarily use the WorkBench colors. When you release the SPACEBAR, the image colors will be used.

Figure R3.3 labels the areas of the Palette window

R3.3.1 How the Palette Colors are Displayed:

At the bottom of the Palette window is the Color Bar, which shows the available colors in the current ColorMap. The colors are arranged left to right, with color zero being the leftmost color, color 1 to the right of color zero, and so on. Depending upon how many bitplanes the current image uses, there may be as few as two colors shown in the Color Bar, or as many as 32 colors for a five bitplane image.

When using EXTRA-HALFBRITE graphics mode (on Amigas that support it), the Color Bar grows in height and displays the EXTRA-HALFBRITE colors below the primary colors they are related to. In EXTRA-HALFBRITE mode, modifying one of the primary colors in the top half of the Color Bar also affects its half-bright relative directly below. See the section 'Changing the ViewModes' for more information on EXTRA-HALFBRITE.

In HAM mode, the Color Bar displays the 16 primary colors used by the image. HAM mode uses these 16 colors and modifies them to produce up to 4096 colors on the screen simultaneously. However, in HAM mode, merely modifying one of the primary colors may not have much effect on the image, since the colors used by the image may ignore the primary colors altogether and use strictly modified color values. For more details on the limitations of HAM mode, refer to the section 'How the Amiga Graphics Modes Affect the Display'.

R3.3.2 Selecting and Adjusting Colors:

The three slide gadgets in the upper left of the Palette window permit you to modify the red, green, and blue values, as well as the hue, saturation, and luminance of a selected color.

You select a color to affect by clicking on the desired color in the Color Bar with the Left Mouse Button. If you click-hold inside the Color Bar and slide the mouse from side to side, the Palette will follow the pointer movements and continuously update your selection until you release the Left Mouse Button. In addition, you can click anywhere on the image and the color selected will be the color of the pixel currently in the center of the pointer crosshairs.

The Palette gives you instant feedback on the current color selection three ways. First, a small marker appears at the top of the Color Bar, directly above the color selected. Second, the Color Box will be filled with the selected color, and the Color Value will reflect the numeric RGB value for that color. Lastly, the Color Slide knobs will position themselves to match the value of the current color selection.

The numeric RGB Color Value is a three digit hexadecimal representation of the current color value. The first digit is the red value, the middle digit is the green value, and the last digit is blue. The hexadecimal sequence ranges from '0' to 'F' (i.e., 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, A, B, C, D, E, F). Since there are 16 possible values for each of the three digits, there are a total of 4096 possible combinations. Once a color has been selected, you can click-hold with the Left Mouse Button on any of the three Color Slide knobs, then drag the knob horizontally while holding the mouse button down. The color and Color Value are modified when you move the knob. By clicking inside a Color Slide but to either side of the knob itself, you can move a slide knob one 'notch' at a time.

By clicking on the RGB/HSV Gadget to the left of the Color Slides, you can switch the color adjustment technique used by the Color Slide gadgets.

In RGB mode, you have individual control over the Red, Green, and Blue intensities for a selected color. All 4096 color possibilities can be accessed through combinations of red, green, and blue adjustments. In HSV mode, you adjust color Hue using the top Color Slide.T

The middle slide is used to adjust Saturation. The bottom slide is used to adjust luminance or intensity. (Due to obscure historical reasons, labeled 'V' for value.)

You are free to switch between RGB and HSV mode at any time. Note that there is not always an exact equivalent for a particular RGB setting when switching to HSV mode. PIXmate uses in this situation.

R3.3.3 Palette Editing Gadgets:

The right-hand side of the Palette window contains the eight Edit Gadgets. These gadgets allow you to copy, exchange, swap, spread, and set color ranges for cycling, as well as undoing any changes you have made.

The Undo gadget undoes the last change made to the ColorMap. Clicking Undo again brings back the last change. The Reset gadget undoes all changes made to the ColorMap during the Palette window session.

In addition, when you are finished using the Palette, you can use Undo Changes from the Edit Menu if you want the old image colors back.

The Find gadget allows you to easily locate or select a color. When you click on the Find gadget with the Left Mouse Button, the Palette window and Screen Title Bar will temporarily disappear, and the currently selected color will flash. Clicking anywhere on the screen using the Left Mouse Button will select the color under the pointer. Any pixels in the image that share the currently selected color flash simultaneously, so you can easily see when you find the color you want. When you wish to exit Find Mode, simply press the Right Mouse Button. The Palette window will pop back up, displaying your selected color.

The remaining Edit Gadgets require two color selections. The first selection is the currently selected color. When you click on the Range, Copy, Exchange, Swap, or Spread gadgets, the Palette Title Bar will prompt you to select a second color to complete the operation. You can cancel an operation at this point by reselecting the gadget, or by clicking on a different gadget. Otherwise, the operation will be completed as soon as you select a second color.

The Range gadget allows you to adjust the range covered by the four independent cycle ranges. See the next section for details on color cycling controls.

The Copy gadget lets you copy one color in the ColorMap to another. You select the color you want to copy, click on the Copy gadget, then select the color you want to replace.

The Exchange gadget, labeled 'Exch', allows you to exchange two colors in the ColorMap. You select the first color, click on 'Exch', then select the color to exchange with.

The Swap gadget exchanges two colors, but also exchanges the bit-map information in the image so that the image appears unchanged despite the color change. You select a color, click the 'Swap' gadget, then select the color to swap with. By swapping a color with color zero (the leftmost color in the Color Bar), you can change the border and background color of the screen to any color without affecting the image.

The Spread gadget, labeled 'Sprd', lets you create a range of new colors between two existing colors in the ColorMap. You select the first color in the spread, click 'Sprd', then select the color to spread to. The colors that lie between the selected colors are mathematically interpolated to produce a range of color values.

The primary use of this technique is to produce different shades of a color. For instance, suppose color zero is set to black, and the last color in the ColorMap is set to white. If you select black, click 'Sprd', then select white, you will get a smooth range of grays, organized darkest to lightest.

Note that there must be more than two colors contained by the spread range to create a spread. The number of colors created by Spread is related to the color difference between the two selected colors, and how many colors the Amiga can display between the two selections.

R3.3.4 Adjusting Color Cycling:

Color cycling is a simple but effective technique for creating special effects by dynamically changing the ColorMap. The Palette window gives you control over color cycling effects, allowing you to select a range of colors to cycle, adjust the speed at which colors are changed, and decide the direction in which colors are cycled. Images using IFF format save information concerning color cycling so you can use the same settings later, or with other programs. You can turn color cycling on and off in PIXmate at any time by pressing the TAB key.

Color cycling works by rotating (also called barrel-shifting) a set of colors in the ColorMap and displaying the image using the shifted colors. After a time delay, the process is repeated. The set of colors to be shifted is called a cycle range, and the Palette has four independent cycle ranges.

Each range is cycled (i.e., shifted) at a certain rate; this rate can be adjusted to be as short as 1/60th of a second or as long as several minutes (about 4.5 minutes maximum). You can control the direction that colors are shifted in, either forwards or backwards, for each range. Ranges can overlap each other to produce unusual effects.

The Cycle Range Selection gadgets, numbered '1 2 3 4', allow you to choose which cycle range to adjust. The currently selected cycle range number is highlighted, and you select a different cycle range by clicking on one of the non-highlighted numbers with the Left Mouse Button.

Below the Color Bar, the extent of the selected cycle range is shown by a marker bar. All colors above the marker in the Color Bar are part of the current cycle range.

You can change the size of a cycle range by selecting the color you want the range to start with, clicking the Range gadget, and then selecting the color to end the range.

The marker below the Color Bar will reflect the new cycle range you selected.

The Cycle Direction Gadget, directly below the Current Color Box in the middle of the Palette window, is a three-way gadget that allows you to control the cycling direction, or disable color cycling for a particular range. The label on the Cycle Direction gadget tells you what the current direction setting is, either 'OFF' for off, 'FWD' for forward, or 'REV', for reverse. Clicking on the Cycle Direction gadget will change to the next option.

The Cycle Speed slide gadget allows you to adjust the time delay between cycles. The position of the slide knob is related to the speed at which the colors cycle; when set all the way to the left of the container, cycling never occurs. When set at the rightmost position in the container, cycling occurs a maximum 60 times per second. There are 70 possible positions you can set the slide knob at, either by click-holding on the knob with the Left Mouse Button and dragging the knob horizontally, or by clicking to either side of the knob inside the container.

Occasionally, you may require finer control over the cycle speed than possible by using the slide knob. You can make small adjustments by pressing the plus ('+') and minus ('-') keys. Holding down the SHIFT key in conjunction with the plus and minus keys produces very small speed changes. Thus, you have a choice of over 20,000 possible speed settings for each cycle range. One thing to note about using very fast cycle speeds is that they consume a great deal of the Amiga's processor time just to keep up with the color changes. Response time to other things, such as mouse movements, may suffer somewhat as a result. Also, PIXmate allows faster color cycling than other programs currently on the market. You may not get the same cycle speed you achieved with PIXmate when using another product.

Also, there is apparently a bug in DeluxePaint II's color cycling algorithm, which will cycle a range forward even if the range has been turned 'OFF'. This behavior is puzzling, since the first version of DeluxePaint obeyed the IFF standard in this regard. Therefore, to turn off a cycle range that is unneeded you can either set its cycle speed to zero, or select a cycle range that has only one color in it.

Figure R3.4
The Color Bias Window

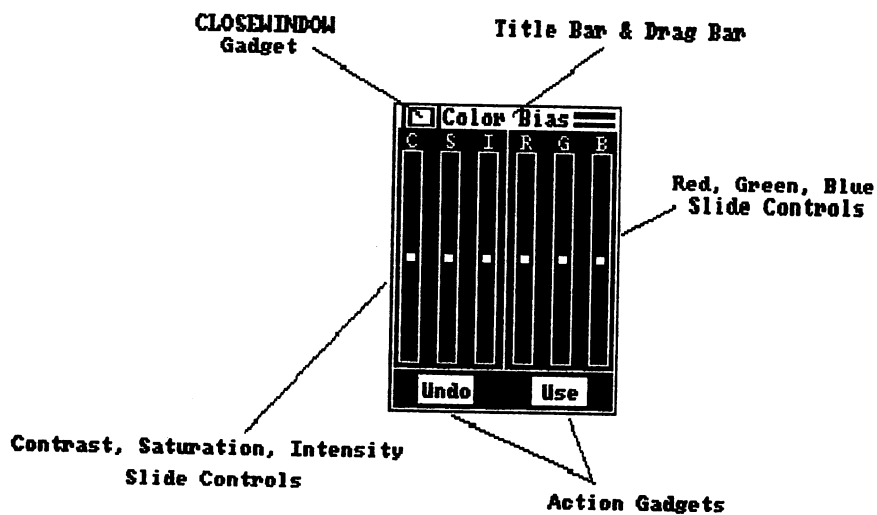


Figure R3.4 The Color Bias Window

R3.4 The Color Bias Window

The Color Bias window gives you a wide range of control over general coloration of an image. Selecting the 'Color Bias' option (keyboard short-cut 'b') from the Color Menu will pop up the Color Bias window. (Note: there is a small delay while PIXmate analyzes the contrast level of the current image.) Like the Palette window, the Color Bias slide gadgets allow you to manipulate the ColorMap used by an image. However, while the Palette gives you control over individual color values, the Color Bias controls affect all the colors simultaneously. The controls are similar to those found on a color television or monitor.

The Color Bias window has special conveniences. The WorkBench colors are used to make it easy to read. Pressing the Right Mouse Button causes the window and Screen Title Bar to temporarily disappear and changes the colors to the ones used by the image. Release the mouse button, and the window pops back into view. Pressing the 't' key turns the Screen Title Bar on and off. Pressing the ESC key closes the Color Bias window and returns you to PIXmate. This is the equivalent of clicking on the CLOSEWINDOW gadget with the Left Mouse Button. The Color Bias Title Bar can be used as a handle to drag the window around the screen. PIXmate will remember the position you leave the window at and try to use that location next time a window pops up. Figure R3.4 shows the Color Bias window and its controls.

R3.4.1 Adjusting Contrast, Saturation, and Intensity:

The three slide gadgets on the left half of the Color Bias window, labeled 'C', 'S', and 'I', are the Contrast, Saturation, and Intensity controls, respectively. The controls are adjusted by click-holding on a slide knob with the Left Mouse Button, and sliding the knob vertically. Alternately, you can click inside the container above or below the slide knob and move the knob one position at a time.

The Contrast slide control allows you to adjust the contrast of the image. When the knob is moved above the default center position, contrast is increased by making the brighter colors brighter. Moving the knob below the center position makes brighter colors darker, and darker colors brighter. The Contrast gadget has a wide dynamic range; at the top of its travel an image will be almost black and white, at the bottom, the image resembles a black and white negative. PIXmate determines what is considered 'dark' and 'light' by sampling a large number of pixels on the screen and calculating their average intensity. Colors brighter than average are considered bright, colors below the average intensity are dark colors. The median color itself is always left unchanged.

The Saturation slide control affects the purity and brilliance of the colors in the ColorMap. Moving the Saturation control above the center position adds saturation, resulting in richer, more emphasized colors. Setting the control below the center position reduces saturation, making the colors appear 'pastel' or 'washed out'. Totally removing saturation from the ColorMap leaves a gray-scaled, black and white image.

The Intensity control affects the brightness (luminance) of an image. When moved above the center position, all the colors in the ColorMap are made proportionally brighter. When moved below the default position, the image becomes darker. A wide range of intensity control is available; at the lowest setting the image will be completely black, at the highest setting the image and screen are completely white.

The Undo gadget permits you to quickly center the controls. Additionally, when you are finished using the Color Bias window, selecting Undo Changes from the Edit Menu will restore the original image unchanged.

Note that the slide gadgets have mutually exclusive effects. If you adjust the contrast control, then attempt to alter any other control, the contrast control will be reset. This is done to prevent an 'infinite response' problem from developing while adjusting a slide control, and to allow you to undo intermediate steps. Clicking on the 'Use' gadget causes the Color Bias window to analyze the image based upon the current control settings, and centers the slide controls for additional adjustments. For example, after adjusting the brightness of an image with the Intensity control, you would click on 'Use'. PIXmate would then compute the new median intensity based upon the brighter image and center the controls. You could then adjust the contrast to bring more definition to the image, click on Use, and so on indefinitely.

The Color Bias controls have unpredictable effects when used with HAM images; for other limitations related to HAM mode, see the section 'How the Amiga Graphics Modes Affect the Display'.

R3.4.2 Adjusting Red, Green, and Blue Balance:

The three slide gadgets on the right side of the Color Bias window, labeled 'R', 'G', and 'B', adjust the red, green, and blue color balance of an image. By default the slide controls are set to the center position. Moving a control above center adds more of that color to the image. Moving a control below the center position lessens the contribution of that color. For instance, moving the Red slide knob toward the top of the gadget container will add more red to the image. Moving the Red control toward the bottom will remove red from the image, ultimately leaving only the green and blue components.

R3.5 Packing Colors

PIXmate offers a variety of ways to organize colors without visually altering an image. One of the most useful is the 'Pack Colors' option from the Color Menu. When selected, Pack Colors performs three duties. First, it sorts the ColorMap by intensity, lowest intensity first. Second, it eliminates colors unused by the image. Third, it insures that each color is used only once. For instance, a ColorMap may contain several identical blacks, with some of the pixels using one of the blacks, and other pixels using another. After the Pack Colors operation, only one black is used by all black pixels in the image. Any unused colors will be replaced by the brightest color value actually used by the image, and thus placed at the end of the ColorMap.

You can abort a Pack Colors operation before it finishes by pressing the SPACEBAR. After the process is finished, you can use Undo Changes to get back the pre-packed image.

The Pack Colors technique will often reduce the number of colors needed by an image, thereby freeing other colors for use, and possibly allowing you to reduce the number of bitplanes needed to display an image.

It may be helpful to use the Palette window to observe the effect Pack Colors has on a ColorMap, since the end result of Pack Colors affects only the ColorMap.

Pack Colors requires a certain quantity of CHIP RAM to perform its operations; if there is insufficient RAM available, PIXmate will inform you of the problem. Refer to the section on low RAM conditions for more information.

R3.6 Sorting Colors

It may be useful to organize the ColorMap used by an image in an orderly fashion. Using the 'Sort Colors...' pair of options from the Color Menu, you can quickly sort the ColorMap by intensity.

Sort Colors has two submenu options. The 'Low to High' option sorts by ascending color intensity, from darkest to brightest. The 'High to Low' option sorts in descending order.

Like most PIXmate operations that take more than a second, you can abort the process by pressing the SPACEBAR before the operation is completed. The Undo Changes option returns the ColorMap to its unsorted state.

As with Pack Colors, the sort operation requires enough CHIP RAM for a temporary buffer. PIXmate will let you know if there is insufficient RAM to complete the operation. (see sections on low RAM conditions)

R3.7 Using Fewer Colors

PIXmate allows you to quickly reduce the number of colors used by an image. This can be the first step toward reducing the number of bitplanes used by an image, or can be used to make room for additional colors in the ColorMap. Selecting the 'Less Colors' option from the Color Menu causes the Less Colors window to appear. (Figure R3.7.)

Below the Less Colors Title Bar is a small string gadget that allows you to enter the new number of colors you want used by the image. The number shown in the string gadget is the current number of colors used. You erase the current number and type in a new number of colors, using standard Intuition string gadget editing techniques (see 'String Gadgets'). The new number you enter cannot be larger than the current number of colors. The minimum number of colors is two. After you type a valid number and press RETURN, PIXmate will construct a new optimal ColorMap using the reduced number colors requested.

Clicking the gadget labeled 'CANCEL!' with the Left Mouse Button (or on the CLOSEWINDOW gadget) allows you to exit the Less Colors request without doing anything. In addition, you can abort the process by pressing the SPACEBAR. Of course, Undo Changes will allow you to restore the original image.

Less Colors requires some additional CHIP RAM to perform its operations; if there is not enough to proceed PIXmate will warn you with a PIXmate Requester.

Note that Less Colors has unpredictable results with HAM images. You can use the 'HAM to 32' option to convert a HAM image to 32 colors, then use Less Colors to further reduce the colors used if necessary.

R3.8 Performing Color Extractions

PIXmate will quickly extract red, green, blue, cyan, magenta, yellow, and gray scale information from an image. The submenu selections available under the 'Extract...' Color Menu item allow you to choose the type of separation you want to perform.

Figure R3.7
The Less Colors Windows

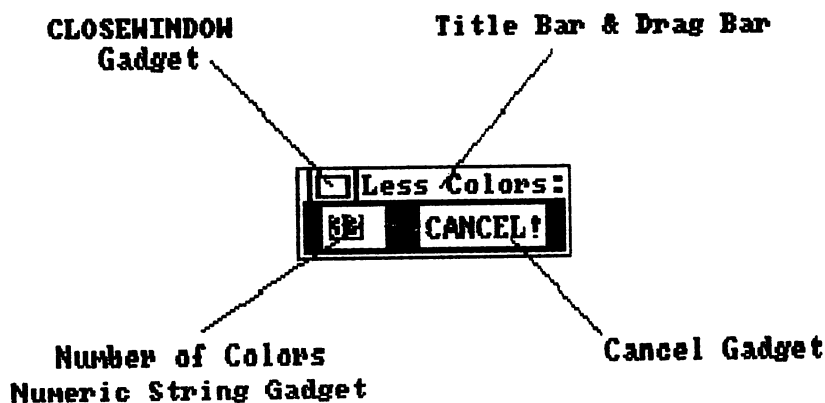


Figure R3.7 The Less Colors Window

All color extractions share certain characteristics. The ColorMap used by the image will have 16 colors, evenly distributed from darkest (always black) to lightest (the brightest shade of the color being extracted). Extracted images always use four bitplanes. Extract operations work on HAM images as well as other graphics modes. The extraction process is an essential step to successful color image processing.

The Extract operation requires sufficient CHIP RAM to allocate a temporary buffer; PIXmate will post a complaint if the buffer cannot be created. See 'Working with Low RAM Conditions' and Appendix B.

R3.8.1 Automatic Extractions:

Automatic extractions come in two flavors, selected by either the 'RGB' or the 'CMY' submenu items under Extract in the Color Menu. The Extract RGB option performs red-green-blue separations and saves them in IFF format. The Extract CMY option produces and saves cyan-magenta-yellow separations.

In either case, the File Selector is used to prompt you for a directory and a name to use as a prefix for the three filenames the color extractions will use. You can abort the extraction process by selecting 'Cancel!' from within the File Selector, or by pressing the SPACEBAR after the extraction process has begun.

If the Extract RGB option is used, PIXmate uses the following naming convention when saving color extractions. The name you selected with the File Selector is used as a prefix or root name, and the suffix string '.RGB.xxx' is appended to the name, where 'xxx' is one of 'red', 'grn', or 'blu'. The 'RGB' part of the name identifies it as a file produced by the Extract RGB option for PIXmate AutoMerge operations (see 'Automatic RGB Merges'). The final suffix identifies the color extracted. The Extract CMY option is similar to the RGB option, except that it appends '.cyan', '.magenta', or '.yellow' to the name.

After all three extractions are completed, PIXmate will restore the original image to the screen.

Obviously, there are several problems that could develop during an automatic extraction, such as insufficient RAM or a write-protected disk. See Appendix B for possible error messages and their remedy.

R3.8.2 Specialized Extractions:

The submenu items in available from the 'Extract...' Color Menu item allow you to select a single color band to extract from the current image. You can separate the 'Red', 'Green', 'Blue', 'Cyan', 'Magenta', 'Yellow', or 'Gray' components of an image with the appropriate Extract option.

Pressing the SPACEBAR during an extraction operation will abort the process. The current image is saved in the Undo Buffer, so you can use Undo Changes to restore the original image after an extraction has completed.

In particular, the Extract Gray option is useful for quickly converting a color image to black and white. You may wish to do this step before performing other image processing functions, in order to eliminate the overhead associated with full color processing.

R3.9 Merging Color Extractions

Once an image has been separated into its red, green, and blue IFF image files using the Extract options from Color Menu, PIXmate can combine the resulting monochrome images to produce a new full color image.

PIXmate features automatic and manual merge operations for maximum flexibility. Both forms share the following information.

In LORES graphics mode, you can merge the three monochrome images into a 4096 color HAM image, or elect to use a 32 color, five bitplane image. In HIRES mode, the mages are merged to produce a 16 color, four bitplane image.

Merge operations use the File Selector to fetch the directory and filenames of the three monochrome images to be merged. You can cancel a merge by using the 'Cancel!' gadget in the File Selector, or by pressing the SPACEBAR after the merge has begun.

The three monochrome images to be merged must all have the same width and height, and must use 4 bitplanes. Files produced by the Extract options fulfill this requirement.

Full color processing operations such as Merge require considerable amounts of CHIP RAM to buffer the three images and produce a fourth. HIRES LACE images take more than 430K of CHIP RAM to succeed; if insufficient RAM is available PIXmate will abort the operation. Refer to 'Working with Low RAM Conditions' to maximize available RAM.

R3.9.1 Automatic RGB Merges:

The 'AutoMerge...' Color Menu options provide an easy way to combine red, green, and blue IFF image files produced by the Extract RGB operation. When merging LORES images, you can select either the '32' color or the 'HAM' options from the AutoMerge submenu. PIXmate will use your choice of color modes to produce the merged image. In HIRES, the '32' option should be used. Refer to the section 'How the Amiga Graphics Modes Affect the Display' for details on the limitations and advantages of the four basic Amiga graphics modes.

When you select an AutoMerge operation, PIXmate pops up the File Selector to prompt you for a filename. The only entries displayed will be files that match the '*.RGB.*' pattern that was used by Extract RGB to produce the files (see 'Wildcard Names' and 'Using the Path-Master(tm) File Selector'). If you select a filename, PIXmate will look for the other two files necessary to complete the red-green-blue triplet, using the same directory as the file you select. For example, if you had used Extract RGB to produce red, green, and blue separations using the name 'Fred', Extract will produce the following files:

Fred.RGB.red
Fred.RGB.grn
Fred.RGB.blu

By selecting any one of these files with the File Selector, for instance 'Fred.RGB.red', PIXmate will automatically look for the other two, in this case 'Fred.RGB.grn' and 'Fred.RGB.blu'. After selecting a filename, AutoMerge will load the three monochrome images. PIXmate then analyzes the color usage, and after a few moments calculation, merges the images into a single full color image, using the graphics mode you selected from the AutoMerge submenu.

Note that AutoMerge requires all three monochrome images to actually exist, residing in the same directory. Please refer to the previous section for more information on merging images.

By using Extract RGB, followed by individual processing of the red, green and blue images, then saving the processed monochrome images and combining them using AutoMerge, you can create thousands of special color processing effects.

R3.9.2 Specialized Merges:

In some cases, it may be preferable to have manual control over the files that are used by a merge operation.

The 'Merge RGB...' Color Menu selections address this need, allowing you to individually select the three monochrome images used. The two Merge RGB submenu options, '32' and 'HAM', permit you to choose the graphics mode used by the resulting image.

Merge RGB uses the current image as one of the three needed to complete a merge request. Thus, you load the first image using the same techniques outlined in 'Loading IFF Image Files'. After selecting the '32' or 'HAM' merge option, PIXmate then prompts you for two additional filenames using the File Selector. The three images must all use the same resolution and number of bitmaps, as described under 'Performing Color Extractions' section R3.8.

Using this technique, you can mix and match various red, green, and blue images produced by the Extract options. PIXmate will automatically sort out which each image, allowing you to select one of three, in any order.

Note that the three images to be merged do not necessarily have to be red, green and blue extractions. However, if you do not use the Extract process to produce the files, or merge something other than a RGB combination, Merge will assign a RGB significance to the images based on the order you select them. Truly bizarre effects can be created by merging RGB files from different images that have the same screen width and height.

R3.10 Color Mode Conversions

Two of the most popular color modes on the Amiga are the 4096 color HAM mode, and the 32 color, five bitplane display. Each color mode has its advantages and limitations, see section 'How the Amiga Graphics Modes Affect the Display'. PIXmate features the fastest, most accurate conversions between these two color modes. In addition, PIXmate lets you convert HAM images to the new EXTRA-HALFBRITE graphics mode, which allowing 64 colors on screen simultaneously without the color smearing problems associated with HAM mode.

Note; these conversions only work when using LORES images, current Amiga hardware does not support HAM or EXTRA-HALFBRITE mode in combination with HIRES.

Like most PIXmate operations, you can press the SPACEBAR to abort the conversion process, leaving your original image untouched.

As always, it is possible to run out of RAM when attempting any processing operation; refer to 'Working with Low RAM Conditions' and Appendix B for any error messages.

R3.10.1 Converting HAM 4096 Color Images to 32 Colors:

Selecting the 'HAM to 32' option from the Color Menu will convert the currently displayed HAM image to a five bitplane, 32 color image. PIXmate will choose the best possible 32 colors to use in the new ColorMap. The entire conversion process takes about 14 seconds for a LORES NOLACE image, and about 21 seconds for a LORES LACE image.

If you attempt to convert a non-HAM image to 32 colors, a PIXmate Requester will remind you that you are in the wrong graphics mode. However, you are given a manual override option in case you want to force the operation, perhaps to create special effects.

R3.10.2 Converting HAM 4096 Color Images to 64 Colors:

Later models of the Amiga 1000, and all Amiga model 500 and 2000 computers use a Revision 8 (or later) Denise graphics chip. This allows you to use the new EXTRA-HALFBRITE graphics mode, which supports up to 64 colors in a ColorMap. PIXmate allows you to convert 4096 color HAM images to EXTRA-HALFBRITE, by selecting the 'HAM to 64' option from the Color Menu. After a few seconds, the HAM image will be converted to a 64 color image. The results of a HAM to 64 conversion are usually superior to those achieved using the HAM to 32 option.

There are two primary drawbacks to converting images from HAM to 64 colors. First, not all Amiga 1000 computers support this graphics mode. Second, PIXmate is the only product currently on the market that supports EXTRA-HALFBRITE, making it rather difficult to use the 64 color images by other less capable programs. Both of these problems areas will improve in the future, as more Amiga owners and software manufactures upgrade to the new graphics chip.

See 'How the Amiga Graphics Modes Affect the Display', and the previous two sections for more details.

R3.10.3 Converting Low Resolution Images to HAM Mode:

Occasionally, you may find it handy to convert a LORES image to HAM mode. Selecting the '32 to HAM' Color Menu option will convert the current image to HAM mode. The process typically takes less than 20 seconds. As usual, you can press the SPACEBAR to stop the conversion. Please refer to the previous sections for other general information pertaining to color conversions. Note that PIXmate will warn you if the image is already in HAM mode.

A possible use for this process would be to quickly convert your LORES images (or HIRES after formatting to LORES) to HAM mode, then saving the result as an IFF file and supporting the image in paint programs that support HAM mode.

R3.11 Matching Colors with Other Images

Using the two 'Match Palette...' options from the Color Menu, you can re-color the current image to match the colors used by another image. The colors to be matched can come from the Other PIXmate screen, or from the color information contained by an IFF image file.

By using the same ColorMap for a group of images, you can combine the images onto a single screen without conflicting color use. This is great for creating images for use by animation packages that require all the graphic elements to share the same colors.

This technique works with HAM images especially well, since HAM images do not depend entirely on the ColorMap for color information.

Please refer to sections 'Working with Low RAM Conditions', 'How the Amiga Graphics Modes Affect the Display', and Appendix B for information concerning potential problems.

R3.11.1 Matching Colors with the Other Screen:

Selecting the 'with Other' option from the Match Palette submenu re-colors the Current image using the ColorMap from the Other screen. PIXmate will copy the ColorMap from the Other screen, then re-color the current image using the best colors available from the Other screen.

As usual, you can abort the conversion process by pressing the SPACEBAR. After the conversion is completed, you can use Undo Changes to get back the original image.

R3.11.2 Matching Colors with an IFF Image File

Selecting the 'with File' option from the Match Palette submenu allows you to match the current image colors with those contained in an IFF image file you select. The File Selector is used to retrieve the desired filename; as usual, you can cancel the operation from within the File Selector.

After selecting a valid IFF image file with which to match colors, PIXmate reads the color information from the file and re-colors the current image using the new colors. You can press the SPACEBAR to abort the process.

This option works with any IFF image file that contains ColorMap information, including palettes saved using the Write Palette option from the Project Menu.

R3.12 Additional Color Manipulations

For greater flexibility, PIXmate provides a few additional editing and special effect features that deal with the ColorMap.

R3.12.1 Copying the Palette to the Other Screen:

By selecting the 'Copy Palette' option from the Color Menu, you copy the colors used by the Current screen to the Other screen. It is similar to the Copy to Other function from the Edit Menu, except only the ColorMap of the Other screen is affected.

R3.12.2 Exchanging Palettes with the Other Screen:

Select the 'Swap Palettes' option from the Color Menu, and PIXmate will exchange the colors used by the Current screen and the Other screen.

R3.12.3 Complementing Colors

Selecting the 'Complement' option from the Color Menu allows you to quickly make a color negative of the current image. Each value in the ColorMap is replaced by its complementary color. Using this technique, you can convert photographic color negatives that have been digitized to positive color images without darkroom processing.

Note that the feature has unpredictable results using HAM images. You can do the equivalent of the Complement operation for HAM images by using the Image Processor window, as detailed in the logical operations section.

R3.12.4 Pseudo-Coloring an Image:

A standard image processing technique known as pseudo-coloring allows you to arbitrarily re-color an image. Pseudo-coloring can often reveal details in an image by presenting the color information differently. Also, it is an easy way to add a 'solarized' look to your image, or create strange color effects.

You have a choice of two different coloring techniques in the 'Pseudo Color' Color Menu item. The first option, named 'Smooth', creates a repeatable rainbow-like ColorMap. The other option, 'Random', creates a different ColorMap every time it is selected. Thousands of palettes can be created. You can use the Write Palette option from the Project Menu to save the new ColorMaps. Using the Read Palette option in batch mode, select a collection of your favorite palettes for quick use.

Effects Menu

R4.1 The Display Control Window

Selecting the 'Display' option (keyboard shortcut 'd') from the Effects Menu brings up the Display Control window. The Display Control window allows you to interactively manipulate the bitmaps used by an image, change any of the four graphics modes, format an image to a desired resolution, magnify or reduce dimensions, and invert or reverse an image.

Like most control windows in PIXmate, pressing the Right Mouse Button hides the Display Control window and Screen Title Bar, and displays current ColorMap used by the image. Releasing the mouse button brings the Display Control window back into view, and sets the display to use your default WorkBench colors so the Display Control is always easy to read. Pressing the ESC key (escape) closes the Display Control window, the same as clicking on the CLOSEWINDOW box. The window's title bar is used to prompt you for action in some situations, and can be used as a drag bar to position the window on the image screen. Pressing the 't' key turns the Screen Title Bar on and off.

The gadget labelled 'UNDO!' in the lower left of the Display Control allows you to undo the previous operation performed. Due to the complex nature of the operations, it is not possible undo the effects of 'UNDO!' by clicking on the gadget again.

For some Display Control operations, additional CHIP RAM is needed for temporary buffers. If you are too low on RAM to perform a requested operation, you will be alerted by a PIXmate Requester. Refer to the section 'Working with Low RAM Conditions' and Appendix B for further information.

The following sections describe each of the Display Control window options in detail. Figure R4.1 shows the Display Control window, and pinpoints the areas discussed.

R4.1.1 Changing the Bitplanes:

The Bitplane gadgets in the upper left corner of the Display Control window allow you to perform a variety of bitplane manipulations on an image.

There are six gadgets, numbered one through six, beneath the 'PLANES' label. These gadgets correspond to the six possible bitplanes an image can use.

Figure R4.1
Anatomy of the Display Control Window

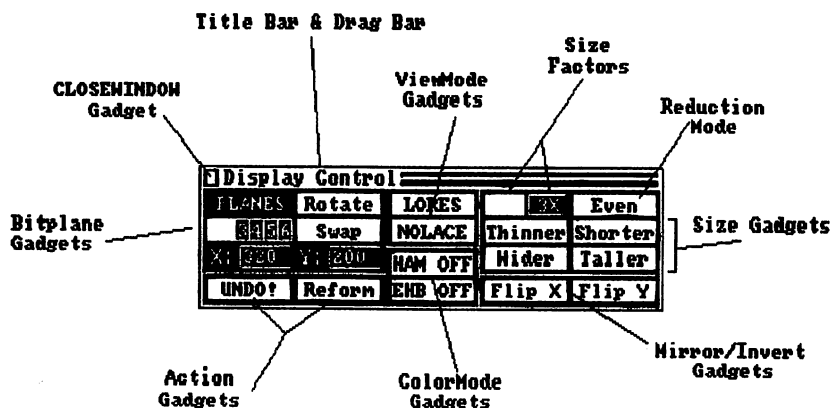


Figure R4.1 Anatomy of the Display Control Window

For each bitplane that is currently used by the image, the corresponding Bitplane gadget is highlighted; the other bitplanes are currently unused.

By clicking on a highlighted Bitplane gadget with the Left Mouse Button, you can turn the equivalent image bitplane off. Clicking on the gadget again will restore the bitplane. For instance, when you first bring the Display Control into use, the Bitplane gadget '1' is highlighted, indicating that bitplane one is in use. Clicking on the '1' gadget turns the highlighting off, and removes bitplane one from the image. You can immediately see the result of dropping a bitplane that is used. Clicking again on the '1' gadget highlights the gadget, and puts the old bitplane back into the image.

Clicking on non-highlighted Bitplane gadgets to the right of the highlighted gadgets causes extra bitplanes to be allocated and appended to the current image bitmap, assuming there are less than six bitplanes to start with (four in HIRES mode). For instance, if you currently have a four bitplane LORES image, the Display Control window will initially highlight Bitplane gadgets '1' through '4'. By clicking on the '5' or '6' gadgets, you can add one or two additional bitplanes to the image. Note that selecting the '6' gadget automatically allocates bitplane.

Bitplanes may also be permanently deallocated in a similar fashion; see section R4.1.3, 'Reformatting an Image' for details.

Adding bitplanes does not affect how an image looks, since there is no image data contained by the new bitplanes. Reducing the number of bitplanes may affect how an image looks, if the image actually uses all the bitplanes for information.

Note that in HIRES mode, a maximum of four bitplanes is permitted by the Amiga hardware. Clicking on the fifth and sixth Bitplane gadgets will flash the screen to remind you that these planes are not available for use in this mode.

To the upper right of the six Bitplane gadgets is the Bitplane Rotation gadget, labeled 'Rotate'. Click on the Rotate gadget and all of the bitplanes in an image shift places in a circular fashion, as shown in Figure R4.1.1. Successive clicks on the Rotate gadget will eventually bring the bitplanes back to their initial positions.

Below the Rotate gadget is a gadget labeled 'Swap'. The Swap gadget allows you to exchange two bitplanes. You click on the Swap gadget with the Left Mouse Button to begin the exchange.

Figure R4.1.1
The Rotate Bitplane Operation

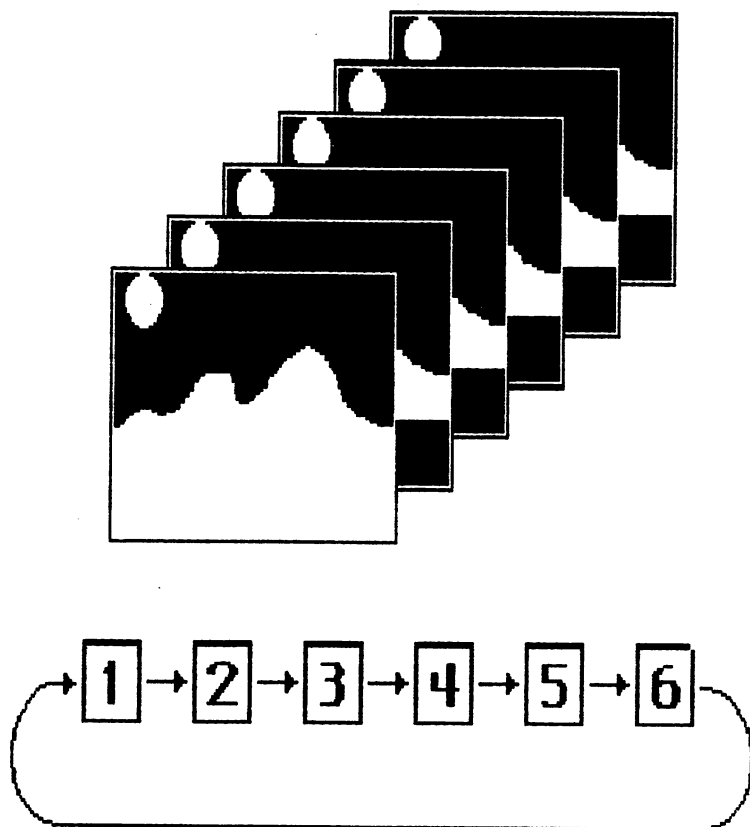


Figure R4.1.1 The Rotate Bitplane Operation

The Display Control window Title Bar will prompt you to click on the first of two Bitplane gadgets needed to perform the exchange. You then click on one of the highlighted Bitplane gadgets. The window title bar will then prompt you to click on the second Bitplane gadget to perform the exchange with. Clicking on a different highlighted Bitplane gadget than the first selection will instantly swap the image information contained in the two bitplanes. For instance, by clicking on the Swap gadget, clicking on Bitplane gadget '1', then clicking on Bitplane gadget '2', bitplanes one and two of the image will be exchanged. You can abort the exchange selection process by clicking the Right Mouse Button, or by selecting a different operation, or by clicking anywhere except for on a gadget with the Left Mouse Button.

Below the bitplane gadgets are two rectangles containing numbers, labeled 'X:' and 'Y:'. The X number is the current bitmap width in pixels. The Y number is the current bitmap height in pixels. If you click inside of the X or Y rectangle with the Left Mouse Button, a cursor will appear, allowing you to delete the old number and type in a new width or height. When you press RETURN, PIXmate will attempt to create a new bitmap using the new size you entered. PIXmate will not permit you to create bitmaps smaller than 320 by 200 pixels, since the Display Control window and other PIXmate windows need at least this much space to display themselves. Also, PIXmate will prevent you from entering values larger than 736 by 480 pixels, since bitmaps larger than this will certainly not fit on the screen comfortably, and require excessive amounts of CHIP RAM to display.

Please note that the width of a bitmap must be divisible by 16; PIXmate will round your 'X:' entries up to the next 16 pixel boundary. For instance, if you specify a width of 329 pixels, PIXmate will round this number up to 336 (16 times 21) pixels. If you type in 337 for the new width, PIXmate will round this value up to 352 (16 times 22). This assures that you will always get a new bitmap that is at least as wide as you wanted, although it may be slightly wider than requested.

If you type in a size for a new bitmap that is smaller than the current one, the right edge or bottom edge of the image will be cropped to match the new size. Specifying a size that is larger than the current bitmap allows you to create images that extend beyond the normal screen borders. If you are low on CHIP RAM and specify a new bitmap that is drastically larger than the original, there is a chance that PIXmate will be unable to create the new bitmap. PIXmate will produce a warning requester and attempt to restore the original bitmap. If for some reason the original bitmap cannot be restored, PIXmate may be forced to terminate.

R4.1.2 Changing the ViewModes

The middle column of the four gadgets in the Display Control window permit you to select any of the ten possible combinations of graphics modes (also referred to as ViewModes) available on the Amiga. The top two gadgets control the resolution used for the display. The bottom two gadgets control the interpretation of color information in when using LORES mode. The four ViewMode gadget labels indicate the current graphics modes selected and in use by the image. When you click on a ViewMode gadget, the graphics mode and gadget label toggle to the opposite setting. The meaning of the eight possible ViewMode gadget labels is as follows.

The topmost ViewMode gadget may be labeled either 'LORES' or 'HIRES', and controls the horizontal resolution of the screen. LORES images can use up to six bitplanes, and can squeeze about 350 pixels on a line before overscanning occurs. Additionally, only LORES images may use the HAM or EXTRA-HALFBRITE color models. The other possible mode, HIRES, squeezes twice as many pixels on a row, giving you more than 700 pixels per scan line without overscan. However, a maximum of four bitplanes can be used in HIRES mode, and HAM and EXTRA-HALFBRITE are not available in this mode.

The next ViewMode gadget down may be labeled either 'NOLACE' or 'LACE', and describes the vertical resolution of the display. When set to the NOLACE mode, up to 240 scan lines may be used without overscan. When set to LACE, the screen is displayed using interlace to produce twice as much vertical resolution, doubling the effective number of rows you can display. However, LACE mode may cause a certain degree of image flicker due to the reduced refresh rate used by the interlace technique. Note that these height estimates are for Amigas with NTSC video circuitry. PAL versions can display more scan lines.

The LORES/HIRES and NOLACE/LACE gadgets can be used in combination to produce other graphics modes, such as HIRES NOLACE or LORES LACE. Clicking on either gadget will immediately change the graphics mode, and change the gadget label to reflect the new mode. PIXmate automatically adjusts any other parameters, such as number of bitplanes, to match the new graphics mode.

Note that changing the graphics modes does NOT change the size of the bitplanes used by a image; rather, the data in the bitplanes is simply interpreted differently by the Amiga hardware. To force PIXmate to allocate new bitplanes, you use the 'Reform' gadget describe in the next section.

Below the two ViewMode gadgets are the two ColorMode gadgets. These gadgets affect how the Amiga processes color information for display when using LORES and five or more bitplanes.

The top ColorMode gadget may read either 'HAM ON' or 'HAM OFF', depending on whether HAM mode is currently on or off. Clicking on the gadget toggles the HAM effect on or off. Note that turning HAM mode on will not have a visible effect until you press the Right Mouse Button to observe the image, or exit the Display Control. You must be in LORES mode and have at least five bitplanes to engage HAM mode.

The bottom ColorMode gadget is labeled either 'EHB ON' or 'EHB OFF', reporting whether EXTRA-HALFBRITE mode is in use or not. As with the HAM gadget, clicking on the gadget turns EXTRA-HALFBRITE mode on or off. As previously noted, EXTRA-HALFBRITE can only be used in LORES mode, and requires a minimum of six bitplanes.

You can add bitplanes in order to turn on HAM or the EHB gadgets, as outlined in the previous section 'Changing the Bitplanes'.

Note that HAM and EXTRA-HALFBRITE modes are mutually exclusive. Turning either one 'ON' turns the other 'OFF'.

The following examples outline potential situations that result as a consequence of using LORES/HIRES and NOLACE/LACE gadgets.

Suppose you load a 320 by 200 pixel 32 color image into PIXmate using the Load IFF option from the Project Menu, then select the Display option. The Display Control window will appear, with the Bitplane gadgets '1' through '5' highlighted, and the ViewModes Gadgets set to 'LORES', 'NOLACE'. If you click on 'LORES', PIXmate will switch to HIRES and refresh the gadget label to indicate the new graphics mode. Everything will be only half as wide now, leaving the right half of the screen unused. In addition, PIXmate automatically turns off the fifth bitplane, since HIRES mode allows a maximum of four bitplanes. Clicking again on the LORES/HIRES gadget returns you to LORES, and adds the fifth bitplane back to the image.

Suppose instead you load a 640 by 200 pixel 16 color image, then use the Display Control window. The Bitplane gadgets '1' though '4' will be highlighted, the LORES/HIRES gadget will read 'HIRES', and the NOLACE/LACE gadget will read 'NOLACE'. By clicking on the LORES/HIRES gadget, the display will become twice as wide and the gadget label will change to read 'LORES'. The right half of the image will overscan past the right edge of the screen, leaving only the left half visible. No bitplanes are affected. By clicking the LORES/HIRES gadget again, HIRES mode is restored.

R4.1.3 Reformatting an Image:

If you have reduced the number of bitplanes in an image using the Bitplane gadgets, or have changed the resolution of the display using the ViewMode gadgets, you must re-format the screen before the Display Control window will allow you to exit. You can accomplish this at any time by clicking on the 'Reform' gadget with the Left Mouse Button. If necessary, PIXmate will create a new screen and restore the image. If no changes have been made that require allocating a new screen, PIXmate will simply flash the screen to let you know that Reform was not needed.

Note that the Reform process is a permanent decision that cannot be undone with the 'UNDO!' gadget. You can alter the display resolution using the ViewModes gadgets as much as you like, but once you select Reform the current screen format will be 'locked in'.

PIXmate will warn you with a PIXmate Requester if the Reform operation will result in a possible loss of bitplanes, or loss of overscanned portions of the image. This allows the cancel of the Reform operation and further ViewModes changes are possible.

When you exit the Display Control window, either by pressing the ESC key or clicking on the CLOSEWINDOW gadget, you will be presented with a PIXmate Requester if the image needs to be Reformed before exiting the Display Control. Clicking on the 'Reformat and Exit' option will create the new screen and finish your session with the Display Control window. Choosing the 'CANCEL!' option will return you to the Display Control.

Note that the Reform operation may require more CHIP RAM than is available. A PIXmate Requester describing the problem if PIXmate is unable to allocate a new screen will appear. Refer to 'Working with Low RAM Conditions' and Appendix B for details.

R4.1.4 Resizing an Image:

The gadgets on the right-hand side of the Display Control window allow you to change the horizontal and vertical size, produce a mirror, or turn an image upside-down. By using combinations of these effects, you can magnify an image to examine small areas in detail, or reduce an image to permit other images to be placed on the same screen.

The four Size gadgets, 'Thinner', 'Shorter', 'Wider', and 'Taller', change the horizontal and vertical size when clicked on with the Left Mouse Button. The current setting of the Size Factor gadgets, labeled '2X' and '3X', determines how much the four Size gadgets reduce or enlarge a particular dimension. For instance, if the Size Factor is set to '2X', clicking on the Thinner gadget will make the image half as wide. Clicking on the Taller gadget will make the image twice as tall. If the '3X' size factor is selected, the image will become a third as wide when the Thinner gadget is used, and three times taller when the Taller gadget is selected. You can switch between the 2X and 3X modes by clicking with the Left Mouse Button on the size factor desired. The selected Size Factor gadget will be highlighted.

The Wider gadget duplicates or triplicates each vertical column of pixels in the image, making the image two or three times wider. The Taller gadget works much the same, except each row of pixels is expanded to take two or three rows. The enlargement process always starts at the upper left-hand corner of the screen. If the current image already fills the screen, selecting Wider or Taller will discard portions of the image that will not fit after the enlargement process.

You can use the 'UNDO!' gadget immediately after an enlargement operation if you change your mind and want the original image back.

Using the Thinner and Shorter gadgets is much like using the Wider and Taller gadgets, except data from the image is selectively discarded and the image is compacted in the horizontal or vertical direction selected.

When using the Thinner or Shorter gadgets, PIXmate offers you four different techniques for reducing the image size. You select which technique you want to use with the Processing Mode gadget in the upper right-hand corner of the Display Control window. The possible choices are 'Even', 'Odd', 'Average', or 'Color', and by clicking on the gadget with the Left Mouse Button, you can switch through the possible modes.

In Even mode, only the even numbered rows or columns are preserved, eliminating the odd numbered rows or columns. Odd mode works the opposite of Even mode, preserving the odd numbered rows or columns. In Average mode, adjacent pairs of pixels are replaced by a single pixel that is the average of the pair. In Color mode, the same averaging technique is applied, but using color processing techniques. The image is separated into red, green, and blue components (see 'Performing Color Extractions'). The three components are reduced in size, then combined to form a new full color image. Since this can be a rather lengthy operation, you may press the SPACEBAR to abort the process. Note that PIXmate will ignore the Color mode selection if color processing is unnecessary.

PIXmate automatically sets the Processing Mode gadget to a mode appropriate for the current image. For non-HAM images, Even mode is the default. Color mode is used for best results with HAM images. You can always change the processing mode manually. Often, it is worth trying several different techniques to get the desired effect with a particular image. For instance, thin vertical details may be destroyed by using the Thinner gadget in Even mode. Using Odd or Average mode instead may preserve more of the vertical details. You can use the 'UNDO!' gadget to try again if the results are unsatisfactory.

The bottom two gadgets, labelled 'Flip X' and 'Flip Y', allow you to flip an image horizontally or vertically. Using 'Flip X' with HAM images, you should use the 'Color' processing mode discussed previously to avoid color streaks.

R4.2 The Image Processor Window

Selecting 'Image process' (keyboard shortcut 'i') from the Effects Menu brings up the Image Processor window. The Image Processor allows you to create thousands of special effects using simple control combinations. As with other PIXmate control windows, you can press the Right Mouse Button and hide the window and Screen Title Bar for as long as the button is held. The 't' key turns the Screen Title Bar on and off. Pressing the ESC key closes the Image Processor window, just like clicking on the CLOSEWINDOW gadget with the Left Mouse Button. The Image Processor window uses the default WorkBench colors for maximum readability. You can drag the Image Processor window around using the window's Title Bar as a handle. PIXmate remembers the location you leave the window at when you exit the Image Processor, and tries to use that location in the future for window placement.

Some image processing techniques can take several minutes to complete; you can always press the SPACEBAR to stop a process before it completes. The image will be restored from the Undo Buffer automatically.

At the bottom left of the Image Processor are the three Action Gadgets, labelled 'UNDO', 'LOAD', and 'FLIP'. Clicking on the 'UNDO' gadget allows you to undo the previous operation (see 'Operations using the Undo Buffer'). The 'LOAD' gadget will attempt to re-load the last image loaded, using the filename shown by the Screen Title Bar.

This is handy for making a fresh start on an image when experimenting with a new technique. The 'Flip' gadget performs the same function as Flip to Other from the Edit Menu; the Current screen is exchanged with the Other screen. See the section 'Flipping to the Other Screen' for more details.

Operations performed by the Image Processor fall into three categories: logical operations, pixel operations, and matrix operations. Logical operations affect the entire image, and treat all pixels equally. Pixel operations work by examining the image pixel by pixel, performing computations, then replacing certain pixels based on the results of the computations. Matrix operations are similar to pixel operations, and apply a matrix technique that allows you to select different orientations of image details to affect.

In addition, the Image Processor can combine image data from two sources. Data may come from the Current screen, the Other screen, or a combination of the two. The results are always displayed on the Current screen (the destination).

Figure R4.2A

Anatomy of the Image Processor Window

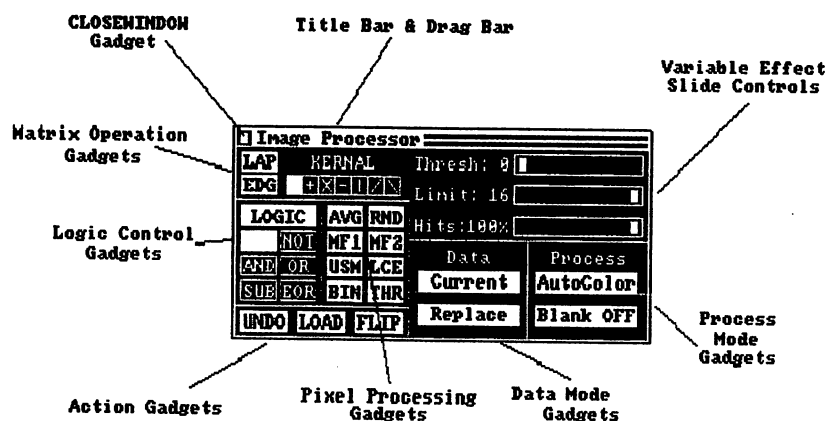


Figure R4.2A Anatomy of the Image Processor Window

Figure R4.2B
Image Processor Data Flow Diagram

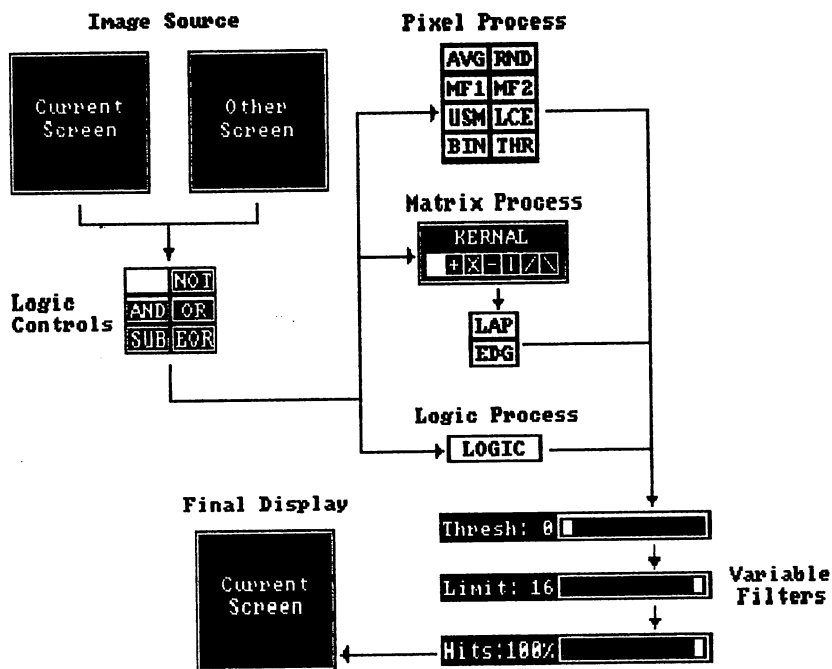


Figure R4.2B Image Processor Data Flow Diagram

The processed data normally replaces the current image; however, you can also merge the new data with the old image for special effects.

Figure R4.2A details the areas of the Image Processor to be discussed. Figure R4.2B shows a data flow chart of the Image Processor control interactions, which affect how image data is processed.

R4.2.1 Logical Operations in Detail:

Clicking the 'LOGIC' gadget, located on the left side of the the Image Processor window, performs an immediate logical operation on the image data. The logical operation performed is determined by the current settings of the six Logic Control gadgets below the 'LOGIC' gadget.

Logical operations can be used with a single image, however, they are particularly useful in combination with an image on the Other screen. You can combine image data from the two screens in a variety of ways using the Other screen and the Logic Control gadgets. See the section 'Operations Using the Other Screen' and the section 'Data Modes' for further information on using the Other screen.

The current setting of the Logic Control gadgets serve a dual purpose, affecting pixel and matrix operations as well as operations involving the 'LOGIC' gadget. Refer to Figure R4.2B and the next section for more details on how the Logic Controls affect other operations.

The gadget labelled 'NOP' (short for No Operation) is highlighted by default. This selection is provided for situations where no logical operation is desired. Clicking on the 'LOGIC' gadget when the 'NOP' logic mode is selected will not change the image; pixels in the image are merely copied directly on top of the old pixels without change.

Clicking on the 'AND' gadget selects the conjunctive logical operation. In AND mode, processed pixels from the source image are logically AND'ed with the pixels in the Current screen. The AND operation acts like a filter; only pixels that are the same in both the source and destination images remain after the AND operation. Note that if the data source is the Current screen, clicking on the 'LOGIC' gadget in AND mode will have no apparent effect, since all of the pixels in the source image (the Current screen) are identical to the pixels in the original image (also the Current screen). When your data source is the Other screen (see the section 'Data Modes'), you can use AND mode with the 'LOGIC' operation to quickly remove all parts of the Current screen that do not match the Other screen.

The 'OR' gadget selects the disjunctive logical operation. In OR mode, processed pixels from the source image are logically OR'ed with the pixels in the Current screen. The OR operation is a type of data merge, where either pixels from the source or from the destination will comprise the final image. Note that when the data source is the Current screen, performing the 'LOGIC' operation will have no apparent effect. When using the data source is the Other screen, clicking on the 'LOGIC' gadget will merge the image from the Other screen with the image on the Current screen.

The 'SUB' gadget selects a subtractive data operation between processed source pixels and the original source pixels. When used in with the 'LOGIC' gadget, the effect is the same as described below for the EOR operation. When used with pixel or matrix operations, the 'SUB' logic mode calculates the difference between pixels from the processed source image and pixels from the original image, then places the result on the Current screen.

Clicking the 'EOR' gadget selects the exclusive-or logical operation, abbreviated EOR for convenience. The EOR operation takes processed source pixels and exclusive-or's them with the original pixels to produce a resulting image on the Current screen.

The EOR operation takes a bit of explanation to understand. Suppose you have a one bitplane image, with black pixels using color zero, and white pixels using color one of the two possible colors. If we represent black pixels by the number '0' and white pixels by the number '1', the EOR operation can be summarized using the following truth table:

Pixel A	Pixel B	Result of EOR
0	0	0
0	1	1
1	0	1
1	1	0

When dealing with more than two colors, the EOR operation considers the color numbers for the two pixels as binary numbers, and performs the EOR operation on a bit by bit basis, resulting in a new color number. For example, suppose a pixel from the processed source image uses color 20, and the original image pixel was color 15.

In binary, the number 20 is represented as 10100. The number 15 is 01111 in binary. Performing an EOR of 10100 with 01111 produces the binary number 11011, which corresponds to color number 27.

Note that EOR'ing a pixel with itself always produces a zero result. Since this would result in a blank screen normally, PIXmate uses a modified version of the EOR function when the 'LOGIC' gadget is selected. Using the previous black and white example, the operation can be described by the following truth table:

Pixel A	Pixel B	Result of EOR and 'LOGIC'
0	0	1
0	1	1
1	0	1
1	1	0

Using the 'LOGIC' gadget in EOR mode will change all the black pixels to white and vice-versa, resulting in a photographic negative of the original. For binary logic experts, the actual operation performed is the equivalent of AND'ing the pixel color numbers together, the complementing the result. The sixth Logic Control gadget, labeled 'NOT', may be turned on or off with a click of the Left Mouse Button. It can be used with any of the other five Logic Control selections. When the NOT flag is set, the processed source pixels are complemented before passing them to the next logical operation to produce the final resulting pixel.

The sixth Logic Control gadget, labeled 'NOT', may be turned on or off with a click of the Left Mouse Button. It can be used with any of the other five Logic Control selections. When the NOT flag is set, the processed source pixels are complemented before passing them to the next logical operation to produce the final resulting pixel.

The NOT operation, like EOR, works on a bit by bit basis when dealing with the color numbers greater than one. In the simplest two color black and white case, the black pixels are changed to white and vice-versa. When dealing with more than two colors, the NOT operation performs a one's complement operation on the color number. For example, color 15, which is 01111 in binary, would become binary 10000 (16) after the NOT operation. Color 21, which is 10101 in binary, would become 01010, or color 10. As you can see, the NOT operation merely flips bits to the opposite of what they were. The net visual effect of this manipulation is the same as creating a ColorMap that is backwards in order from the original (i.e., a negative image).

Note that the NOT operation works in combination with other Logic Controls, such as the AND operation, to produce new logical operations, such as NOT-AND (commonly abbreviated NAND), or the NOT-OR (NOR) operation. Certain combinations of logic may result in equivalent operations, or result in a blank screen (logically tautologic operations).

R4.2.2 Pixel Operations in Detail:

The eight Pixel Processing gadgets, located to the right of the Logic Controls, perform a variety of pixel operations on image data. They work in combination with the three slide controls and the Logic Control gadgets to produce thousands of possible effects. In addition, data used by pixel operations can come from either screen, and may be combined with or replace data on the Current screen.

Clicking on the 'AVG' gadget performs an Average on source pixel color numbers, resulting in a color number that most closely represents the majority of the pixels in a small area. For each pixel in an image, PIXmate looks at a three by three area of pixels surrounding a center pixel. PIXmate adds the nine color numbers together, then divides by nine and rounds the result to the nearest integer color number. The center pixel in the three by three array uses this new averaged color number. PIXmate then moves on to the next pixel over, until all the pixels have been averaged. The effect of pixel averaging is to smooth or blur small details or imperfections in an image, resulting in a cleaner, less noisy image.

Clicking the 'RND' gadget applies a pixel Randomizing technique to the source image data. Randomizing works by examining a three by three array of pixels, and replacing the center pixel in the array with one of the nine pixels in the array, chosen at random. This process is repeated for every pixel in the image. Randomizing causes an image to appear 'grainy' or diffuse.

The gadgets labeled 'MF1' and 'MF2' use two versions of the Median Filter process. The median filter works much the same as the 'AVG' averaging technique, except the center pixel in an area is replaced by the median color number instead of the average. 'MF1' uses a three by three array of pixels to determine a median. 'MF2' uses a five by five area to calculate the median, and produces a stronger effect than the 'MF1' filter. Median filtration is useful to remove small defects or noise in an image without seriously blurring major features. The median technique often produces better results than using the 'AVG' averaging process, however, it is a slower process than pixel averaging. When full color processing HIRES LACE images using the 'MF2' operation, more than 650,000,000 computations can be necessary!

The 'USM' gadget processes the source image using the UnSharp Masking enhancement technique. Abbreviated 'USM', the unsharp masking algorithm essentially subtracts a blurry version of the image (the 'unsharp' component) from the original image data, resulting in a sharper, more detailed image. PIXmate uses a five by five matrix of pixels when performing its calculations for high quality results. The unsharp masking procedure is based on a form of Laplacian correlation; while implementation details are beyond the scope of this manual, the interested reader is urged to refer to the suggested reading list in the Technical Reference Section.

The 'LCE' gadget performs a technique known as Local Contrast Enhancement, useful for emphasizing or amplifying small details or features in an image. Local contrast enhancement (LCE for short) examines a five by five array of pixels and determines the average intensity of the 25 pixels in the array. This average is then compared to the center pixel in the array. If the center pixel is brighter than the surrounding average, LCE will make that pixel even brighter. If the pixel is darker than the local average, the pixel is further reduced in intensity. The LCE technique is similar to the USM operation, but may produce better results in some circumstances.

Clicking the 'BIN' gadget applies a Binary decision process to each pixel in the image. The BIN operation produces a two color version of the source image, using the first and last color available in the Color-Map for the result. For instance, if the first color is black and the last color is white, the result of the BIN operation will be a strictly black and white image. The current setting of the Threshold slide control is used to determine which pixels become black or white. Pixels that have a lower color number than the current Threshold will be replaced by color zero. Pixels that have a higher color number than the Threshold value will be replaced by the highest available color number. This binary, high/low operation is applied to each pixel in the image.

Note that if the Threshold control is set to '0', none of the pixels can have a lower color number, and the entire image will become the same color. Similarly, if the Threshold control is set to maximum; all of the pixels will have a lower value than the threshold, so all of the pixels will become color zero. Other threshold settings will selectively reduce the image to two colors. The BIN process can be used to prepare images for desktop publishing applications, or as the first step in an image classification or template-matching operation.

The 'THR' gadget, short for Threshold, is very similar to the Binary process described for the BIN gadget. The difference is that pixels whose color numbers are greater than the current Threshold Control setting are not affected, while pixels that fall below the Threshold level are changed to color zero. The THR operation is useful for selectively eliminating darker regions of an image, such as unwanted background details that surround a brighter central feature.

R4.2.3 Matrix Operations in Detail:

PIXmate provides two specialized forms of pixel operations, called matrix operations, that allow you to selectively enhance certain types of image details. You select the type of image detail by clicking on one of the seven Kernal gadgets (see Figure R4.2A). The current Kernal selection is highlighted. Clicking the 'LAP' or 'EDG' gadget performs either edge enhancement or edge detection, using the Kernal selection to determine the orientation of edges to be affected.

The labels on the seven Kernal gadgets represent a miniature picture of the kinds of edges the matrix operation will affect. For instance, the Kernal gadget with the '\$' label matches horizontal and vertical edges, such as those in a grid. The 'X' kernal responds best to diagonal edges. Edges that 'go against the grain' of the current kernal selection will be suppressed or ignored.

The 'LAP' gadget, short for Laplacian, uses a five by five Laplacian correlation algorithm similar to the process used by the USM technique described in the last section. By selecting an appropriate Kernal gadget before clicking on 'LAP', you can emphasize different edges in an image. In particular, using the '*' Kernal with 'LAP' will perform a full-strength enhancement process, exaggerating the smallest details.

The 'EDG' gadget, short for Edge, performs an optimized Sobel edge detection process on an image, using the selected Kernal to determine which edges respond most strongly to the process. Edge detection is used to remove everything but edges from an image, leaving a ghostly outline of objects and details. This technique can be useful as the first step in an automated image recognition process, or to detect small details and imperfections in an image.

Pixels that result from a matrix operation are also affected by the Logic Control settings and the Slide Controls. Refer to Figure R4.2B for a diagram of how these controls are interrelated.

R4.2.4 The Slide Controls:

The three slide controls allow you to fine-tune the effects created by the pixel and matrix operations described in the preceding sections. The current settings are used by PIXmate on a pixel by pixel basis to determine whether the processed or unprocessed result of an operation is used as the final pixel result. Figure R4.2B summarizes how data is modified by the slide control settings.

The Threshold control, labeled 'Thresh', lets you adjust the sensitivity of other processes. Processed pixels are compared with the original pixels; if the difference between the two pixels is greater than the current Threshold setting, the processed pixel is used. Otherwise, the original source pixel is used. When the Threshold control is set to zero, all differences are considered significant and processed source pixels are always used. If the Threshold is set to maximum, the difference between processed and unprocessed pixels will always be smaller than the Threshold; thus, none of the processed pixels will be used.

Note that the interpretation of the Threshold setting is slightly different when using the BIN and THR gadgets, as described in the section on pixel operations.

The Limit control lets you adjust the maximum permissible change between a processed and unprocessed pixel. If the difference between the two pixels exceeds the Limit setting, the original pixel will be used instead of the processed one. At its maximum setting, the Limit filter will let changes of any magnitude through. When set to zero, any change between processed and original pixels is greater than the limit; thus only unprocessed pixels will result. Note that the Limit and Threshold controls are closely related. If you set the Limit less than the Threshold, processed pixels will never be used in the resulting image.

The third slide control, labeled 'Hits', lets you add a random element to the selection process, allowing very fine control over the total image processing effect. The setting of Hits slide is expressed as a percent probability that the processed pixel will be used. When set to '100%', processed pixels are used 100 percent of the time. When set to '0%', processed pixels are never used. If '50%' is selected, processed pixels will be used half the time, and unprocessed pixels the other half. This is similar to flipping a coin or rolling a die for each pixel after processing, and deciding whether to use the processed result or the original pixel based upon the random event.

Combinations of settings for the three slide controls permit an almost unlimited range of effect. You can try different settings with a particular process until you get the desired effect, clicking 'UNDO' between experiments to restore the original image.

R4.2.5 Data Modes:

PIXmate offers a choice of data sources, and allows you to control how processed data from a source is placed on the Current screen. The two Data Mode gadgets allow you to select the four possible combinations.

The top Data Mode gadget determines whether image data from the Current screen or the Other screen is used. Normally, the data source is the Current screen image, and the source gadget will be labeled 'Current' to reflect this state. Clicking on the gadget selects the Other screen as your data source. See the section 'Using the Other Screen' for more details about the features of the Other screen.

You can use the 'FLIP' gadget to preview the image on the Other screen before performing an operation. Note that if no Other screen exists, selecting the 'Other' mode will force the creation of the new screen. Also, the Current screen and Other screen must be the same width and height for dual screen processing operations. You can use the Display Control to format one of the images if the dimensions are different.

The other Data Mode gadget selects whether processed data replaces Current screen data, or is merged with the original image using an overlay technique. By default, 'Replace' is selected. Clicking on the gadget will switch to 'Merge' mode.

Note that when processing data from the Other screen using the 'LOGIC' gadget, the two images are always merged as a convenience. The Logic Control settings give you a variety of ways to combine the two images.

Using combinations of the four possible Data Mode selections allow a wide range of special effects to be created.

R4.2.6 Processing Modes:

The Processing Mode gadgets are used to select the color processing technique PIXmate uses, and to determine whether screen blanking is used to reduce processing time.

PIXmate automatically selects the most appropriate color processing technique for a given image when the Image Processor is called into use. Monochrome images, like those produced by PIXmate's extraction process (see 'Performing Color Extractions'), are normally processed in a one pass operation referred to as 'Mono Mode' on the gadget label. Color images use a three pass operation that individually processes the red-green-blue components of the image, then combines the results to produce a new full color image. This is called 'AutoColor' mode. The third technique, 'AutoHAM', is used for 4096 color HAM images to produce greater color accuracy.

You can override the default color process used by clicking on the gadget. Repeated clicks on the gadget will cycle through the possible processing modes. PIXmate warns you if using AutoColor or AutoHAM processing is not required, since full color processing takes about four times longer than 'Mono Mode'. Note that in HIRES, AutoHAM is not available as an option.

As cautioned by the section 'Merging Color Extractions', full color processing uses enormous amounts of CHIP RAM in HIRES and HIRES LACE modes; refer to the section 'Working with Low RAM Conditions' if you encounter problems processing an image due to lack of RAM.

The bottom Processing Mode gadget turns screen blanking mode on or off. The default setting, 'Blank OFF', allows you to watch while PIXmate processes the image. Clicking the gadget selects 'Blank ON' mode, which enables automatic screen blanking during pixel and matrix operations. Screen blanking disables the Amiga's graphics display while processing takes place, then turns the display back on after the selected operation has completed. When the screen is blanked, the microprocessor never has to wait for a display refresh to complete, and thus can run at full speed. With 'Blank ON', total processing time can be cut in half when working with HIRES LACE 16 color images. The obvious disadvantage is that you cannot see what the result of an operation will be until the process is completed.

R4.3 The HistoGraphic Equalizer Window

The PIXmate HistoGraphic Equalizer window shows you how color information is distributed in an image, and allows you to adjust the distribution in a quick, simple operation. This adjustment process, known as histogram specification, is a powerful technique for enhancing contrast in images, especially those that have poor use of the available dynamic range. In addition, the specification technique can be used to reduce the number of colors used by an image in a selective fashion.

Figure R4.3
Anatomy of the Histogramic Equalizer Window

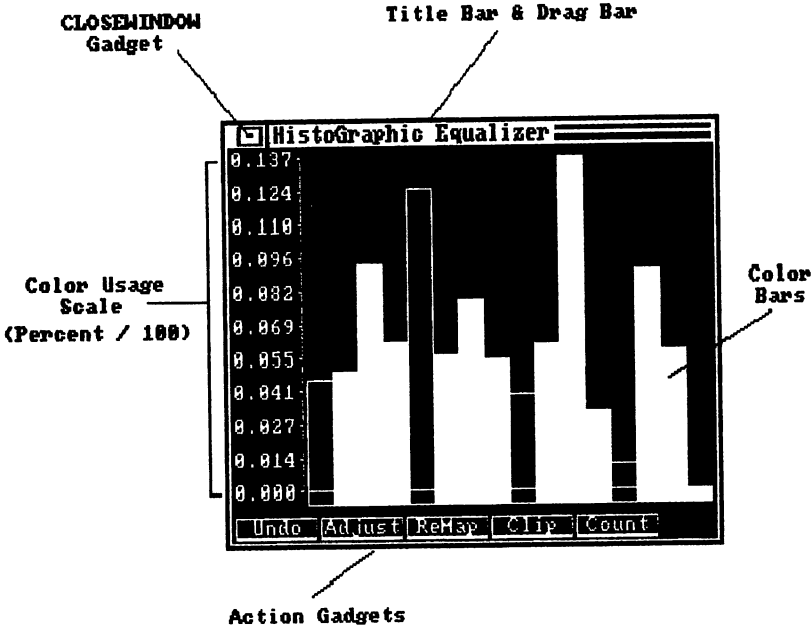


Figure R4.3 Anatomy of the HistoGraphic Equalizer Window

Selecting 'Histogram EQ' (keyboard shortcut 'h') from the Effects Menu starts the histogram process. PIXmate counts the number of times each color is used by the current image, and after a few moments, summarizes the results in bar graph format. Figure R4.3 shows a typical histogram, and points out the parts of the HistoGraphic Equalizer window to be discussed.

You can cancel the histogram process during the initial pixel count by pressing the SPACEBAR. The HistoGraphic Equalizer window shares many of the same features as other PIXmate windows. Pressing the Right Mouse Button causes the window and Screen Title Bar to disappear; releasing the button brings the window back. Pressing the 't' key turns the Screen Title Bar on and off. The ESC key shuts the window and returns you to PIXmate, as does clicking on the CLOSEWINDOW gadget. The window uses the two most contrasting colors from the image's ColorMap to render itself; if for some reason the window and gadgets are difficult to see, you can press the SPACEBAR to temporarily use the WorkBench colors.

The color bars are organized by ascending color number, with color zero the leftmost bar. The height of a color bar corresponds to the percentage of the image that uses that color. The numeric values to the left of the color bars provide an estimate of the probabilities involved, using a standard 0.000 to 1.000 scale. To convert to percentage, simply multiply the probability value by 100. More accurate data is available using the 'Count' feature (see section R5.3, 'The Pixel Count Window'). You can use the Pack, Sort, or Extract processes to organize the colors in a consistent manner before using the HistoGraphic Equalizer or the Pixel Count feature.

By default, PIXmate samples all the pixels in an image when generating the histogram. You can limit the sample area to a rectangular region by clicking on the 'Clip' gadget, then selecting an area using the same procedure described in the section 'Clearing Part of the Screen'. After selecting an area, PIXmate will count the pixels and display the new statistics. The gadget label changes to read 'UnClip', reminding you that a Clip is still in use. The Clip remains visible until you remove the Clip by clicking the gadget again. You can then clip another section of the image.

Note that due to the nature of HAM mode, the results of a histogram can be unpredictable at best. Therefore, PIXmate will not allow you adjust the histogram in HAM mode. You can use the HAM to 32 conversion or use the Extract and Merge color processing techniques from the Color Menu to deal with HAM images, if you must.

R4.3.1 Adjusting Color Distribution with the Equalizer:

Once a histogram has been displayed, you can adjust the color distribution using a histogram specification technique. If you have ever used a graphics equalizer to adjust the sound quality of a home audio system, you will notice that the adjustment process is very similar.

Clicking on the 'Adjust' gadget turns the adjustment mode on. At the top of each color bar, a marker becomes visible, showing the default equalizer settings. To adjust the settings, click anywhere in the color bar area with the Left Mouse Button, and drag the pointer horizontally or vertically while holding the button down. The markers will jump to the position the pointer is at as you move the mouse. You can use a free-hand drawing technique to quickly sketch the general shape of the new histogram you desire, or make small adjustments to a single equalizer setting this way. Clicking the 'Adjust' gadget again erases the equalizer settings from the window.

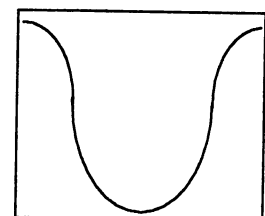
After you have specified the shape of the new histogram with the equalizer, clicking on the 'ReMap' gadget performs the actual image translation. You can abort the translation process by pressing the SPACEBAR; PIXmate will restore the original image and histogram. When the translation process is finished, the window reappears and displays the new histogram for the translated image. Clicking the 'Undo' gadget restores the pre-equalized image and histogram, allowing you to quickly compare the changes and/or make further adjustments.

Histogram specification is a powerful technique with many uses, but is especially useful to alter the contrast of monochrome images, such as those produced by 'Extract Gray'. The five most useful equalizer settings are shown in Figure R4.3.1, along with a description of their typical effect on an image. You merely sketch in the general shape for the equalizer settings shown in the diagrams, then click on the 'ReMap' gadget to perform the effect.

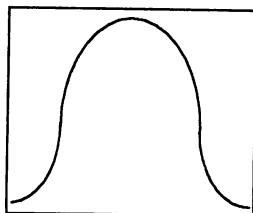
Another useful technique is to use the Clip feature to histogram just the area of the image you want to enhance. By adjusting the equalizer settings to a 'flat' setting (i.e., the all the markers are set to the same level) and clicking on the 'ReMap' gadget, you can enhance areas of an image that appear over or under-exposed. Note that overall image contrast may suffer at the expense of improving contrast in a specified Clip region.

As previously mentioned, the histogram specification process is not directly applicable to HAM images. PIXmate will disable the 'Adjust' and 'ReMap' options when displaying histograms for HAM images.

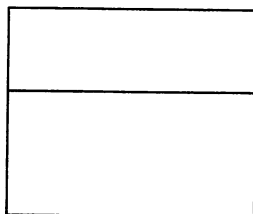
Figure R4.3.1 Common HistoGraphic Equalizer Settings



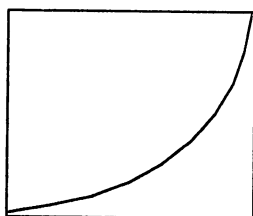
BOOST CONTRAST



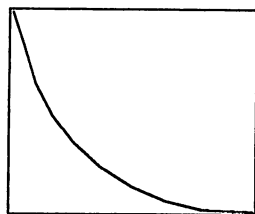
REDUCE CONTRAST



FULL CONTRAST
RANGE



BRIGHTER IMAGE



DARKER IMAGE

Figure R4.3.1 Common HistoGraphic Equalizer Settings

When working with color images (i.e., images NOT produced using the Extract process), adjusting the histogram and translating the image may not produce the result you expect.

This is due to the mathematical nature of the histogram specification technique, which assumes that adjacent colors in the ColorMap are different shades of the same color. By experimenting with the equalizer settings, using 'ReMap', and liberal use of the 'Undo' feature, you can explore thousands of unusual color effects.

R4.4 Automatically ReFormatting Images

For convenience, PIXmate offers the ability to automatically format an image to match any of the four most common Amiga display modes.

The 'ReFormat As...' Effects Menu item has four submenu items that allow you to select the desired format. The possible selections are '320X200', '320X400', '640X200', and '640X400'. The 320X200 selection is equivalent to the LORES NOLACE mode. 320X400 uses LORES LACE mode. 640X200 uses HIRES NOLACE, and 640X400 uses HIRES LACE mode, the highest resolution.

After you select a format, PIXmate determines what changes (if any) are necessary to perform the conversion, and carries them out automatically.

When converting a LORES image to HIRES (i.e., the 640X200 or 640X400 selections), PIXmate may have to reduce the number of colors used by the image, since at most 16 colors are available in HIRES mode. For instance, when converting a 32 color or HAM image to HIRES, PIXmate will use the best 16 colors for the new image. A PIXmate Requester will warn you if fewer colors will be used, and allow you to either continue the automatic process or cancel the operation. During the color conversion process, the operation may be aborted by pressing the SPACEBAR.

You can duplicate the automatic process that PIXmate uses manually, by reducing the number of colors using 'HAM to 32' or 'Less Colors' as appropriate, then using the Display Control to re-size and format the image as desired.

Note that low RAM problems can develop when using HIRES, as described in previous sections 'The Display Control Window' and 'Color Mode Conversions'. See 'Working with Low RAM Conditions' if you encounter problems due to insufficient RAM.

Info Menu

R5.1 Memory Usage Information

Since PIXmate can require considerable amounts of memory to perform an operation, PIXmate also offers an easy way to gauge the amount of RAM (Random Access Memory) available on your Amiga. Selecting the 'Memory' option (keyboard shortcut Right Amiga-m) from the Info Menu brings up a standard PIXmate Requester, showing the current memory free for use by PIXmate and other programs in the Amiga's multitasking environment (see Figure R5.1).

The memory information is divided into three categories: CHIP, FAST, and Total RAM available. The number of bytes free (i.e., available), as well as the size of the largest chunk available is shown.

PIXmate internally monitors the amount of RAM available in the system, and uses available memory as efficiently as possible. If PIXmate is unable to perform a certain operation, it is probably due to lack of CHIP RAM. PIXmate will report the problem with a requester or an alert, depending upon the severity of the shortage. You can use the 'Memory' option to check the amount of RAM free before starting an operation, or to estimate how much RAM you lack if an operation failed.

This information requires a description of how the Amiga uses memory, and the differences between CHIP RAM and FAST RAM.

The standard Amiga 1000 is shipped with 256,000 bytes (256K) of CHIP RAM, and can be expanded to 512K of CHIP RAM, using a memory board that fits inside the front of the Amiga 1000 case. The Amiga 500 and 2000 are shipped with 512K of CHIP RAM standard. All three models allow you to add large amounts of FAST RAM to the system, using memory boards that fit into the Expansion Bus, or internally. The Amiga's operating system easily supports 8,000,000 bytes of FAST RAM and more.

For most purposes, the Amiga can use either CHIP or FAST RAM interchangeably. However, tasks that involve the Amiga's custom chips can only use CHIP RAM. This includes displaying images, controlling disk drives, and producing sound. PIXmate takes advantage of any FAST RAM you have available, thereby leaving more CHIP RAM available to the custom chips.

CHIP RAM is the most valuable type of memory to PIXmate, since image processing can require huge amounts of CHIP RAM to store and manipulate image data. For instance, a 640 by 400 pixel, four bitplane image requires 128K of CHIP RAM to display. Performing full color processing would take over three times as much CHIP RAM; in this exam-

Figure R5.1
The Memory Available Requestor

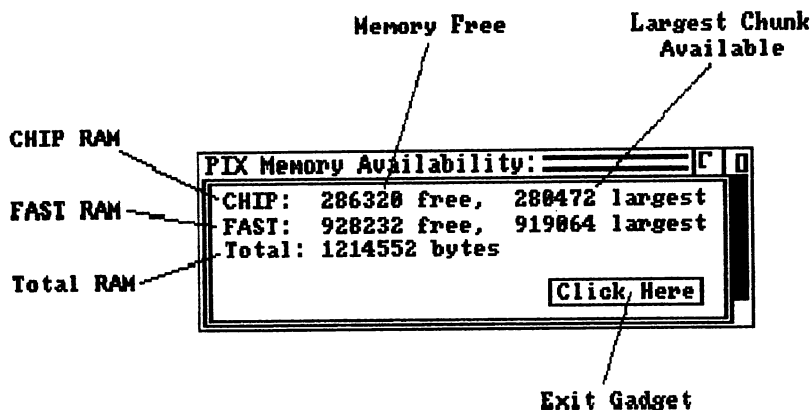


Figure R5.1 The Memory Availability Requestor

ple requiring about 430K of CHIP RAM to succeed. Another consideration is that CHIP RAM for image bitplanes must be contiguous chunks of memory. In this example, each of the four bitplanes would require separate 64K chunks of CHIP RAM. In addition, the Amiga operating system, the WorkBench, and other programs (clocks, text editors, etc.) consume a certain amount of CHIP RAM.

As you can see, it is fairly easy to run out of CHIP RAM, or worse, have a worthless collection of memory chunks too small to be useful. You might have several million bytes of FAST RAM available, but still be unable to perform an operation due to lack of CHIP RAM. Unfortunately, the current Amiga design limits you to a maximum of 512K of CHIP RAM. (This could change in future Amiga hardware. Pleading with Commodore might help.)

R5.2 Display Format Information

Selecting the 'Format' option (keyboard shortcut Right Amiga-f) from the Info Menu brings up a PIXmate Requester containing information about the dimensions and graphics modes associated with the current image. Figure R5.2 shows a typical 'Format' information requester.

The title bar of the requester shows the filename of the last file loaded. The first line of text, labeled 'BitMap:', describes the dimensions of the image in terms of width, height, and depth. Width and height are measured in pixels, and depth refers to the number of bitplanes used. Next to the dimensions, the amount of CHIP RAM consumed by the image data is given in bytes. The second line of text, labeled 'Colors:', shows the number of colors possible using the current display graphics modes, as well as the actual number of colors used by the image, if known. The third line of text, labeled 'Modes:', describes the current graphics modes in effect.

R5.3 The Pixel Count Window

Selecting the 'Count' option from the Info Menu (keyboard shortcut Right Amiga-c) performs a pixel count and analysis by color value. After a few seconds while the counting process takes place, the Pixel Count window appears, as shown in Figure R5.3. The Pixel Count window provides exact statistics on color usage in an image, and permits you to limit the sample to any rectangular section of an image.

The Pixel Count window has many of the conveniences offered by other PIXmate windows. Pushing the Right Mouse Button hides the Pixel Count window for as long as the button is held down. Pressing the 't' key turns the Screen Title Bar off and on. Pressing the SPACEBAR during the counting process aborts the count; after the counting process is over, pressing the SPACEBAR allows you to temporarily use

Figure R5.2 The Formal Information Requestor

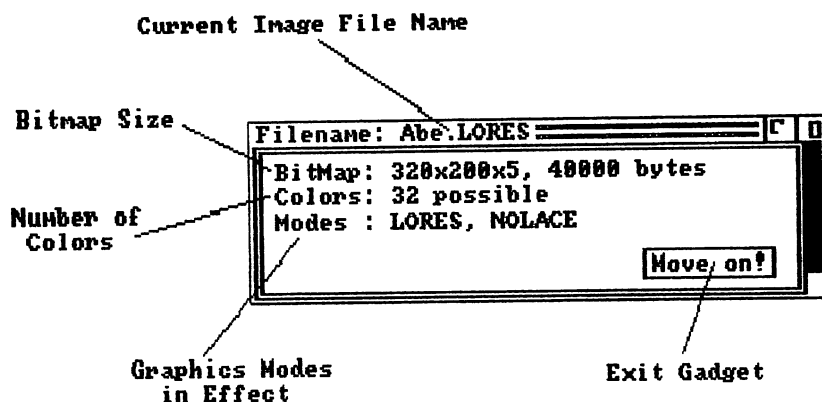


Figure R5.2 The Format Information Requester

Figure R5.3
Anatomy of the Pixel Count Window

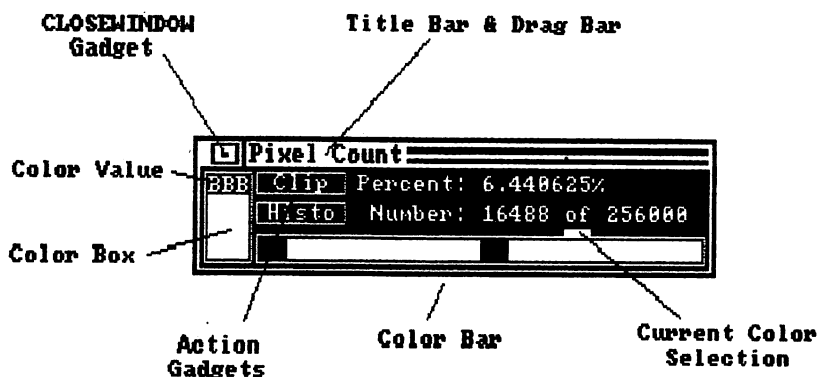


Figure R5.3 Anatomy of the Pixel Count Window

the WorkBench colors. This is handy when the Pixel Count window is difficult to see due to poor contrast in the current ColorMap. Pressing the ESC key closes the Pixel Count window, as does clicking on the CLOSEWINDOW gadget.

Color usage statistics are given two ways. Next to the 'Percent:' label, the percent usage for the currently selected color is printed, using six decimal places of accuracy. Below the percentage and next to the 'Number:' label, the usage count for the currently selected color and total population figures are printed. The first number gives you an exact count of the number of pixels that use the currently selected color, the second number indicates the total number of pixels in the sample area. The percentage shown is directly related to these two numbers, using the following simple formula:

$$\text{percentage} = 100 (\text{count} / \text{sample size})$$

Selecting a color is easy; merely click with the Left Mouse Button on any portion of the screen that uses the color you want. The current color selection is confirmed three ways. First, the Color Box on the left of the Pixel Count window will be filled with the selected color. Second, the Color Value in the Color Box will change to reflect the new red-green-blue value. Third, the small Color Bar Marker will be positioned above the color currently selected. This selection process is very similar to the one described for the Palette window, in the section 'Selecting and Adjusting Colors'.

Initially, all the pixels in the image are counted. You can sample a rectangular region by clicking on the 'Clip' gadget, then selecting an area using the same procedure described in the section 'Clearing Part of the Screen'. After you have selected an area, PIXmate will count the pixels and display the new statistics. The gadget label changes to read 'UnClip', reminding you that a Clip is still in use. The Clip remains visible on screen until you remove the Clip by clicking the gadget again. You can then clip another section of the image.

The statistics used by the Pixel Count window can be used directly by the HistoGraphic Equalizer. Clicking on the 'Histo' gadget switches to the HistoGraphic Equalizer window and displays the histogram of the current sample (see 'The HistoGraphic Equalizer Window' section). Clicking on the 'Count' gadget at the bottom right of the HistoGraphic Equalizer window returns you to the Pixel Count window. Thus, by switching between the two windows, you can get general color usage information from the histogram, then use the Pixel Count window for more exact statistics.

R5.4 The Coordinate Display Window

PIXmate offers a simple, versatile system for displaying the exact position (coordinates) of the mouse pointer. Selecting the 'Coords' option (keyboard shortcut Right Amiga-period) from the Info Menu turns on the Coordinate Display window, as shown in Figure R5.4. Selecting the option again turns the the display off, as does clicking on the CLOSEWINDOW gadget on the left of the Coordinate Display window.

The current position of the mouse pointer is shown inside the window, using raster-scan XY format. The number next to the 'X:' label is the horizontal position, the number after the 'Y:' label is the vertical position.

Note that raster-scan XY coordinates are different than the XY coordinates used in mathematics; the Y-axis is reversed. Thus, the upper left corner of the screen has the raster-scan XY coordinates of (0, 0), while the lower right corner of the screen has the maximum X and Y value.

You can reset or 'zero' the coordinates to a certain position by pressing the '.' (period) key. You can use this feature as a kind of tape-measure, by moving the mouse pointer to beginning of a distance to measure, pressing the period key, then sliding the pointer to the other end of the distance to be measured. The distance in pixels can then be read from the Coordinate Display window. The reset feature is also useful for marking a point on the screen for easy reference later.

The Coordinate Display window works with the other PIXmate windows, and is especially useful when clipping portions of the screen. By remembering the coordinates of the beginning and end points of a Clip, you can clip the same region of an image in a repeatable fashion.

By default, the Coordinate Display window appears near the top right-hand edge of the screen. You can click inside of the window with the Left Mouse Button, then drag the window while holding the button down.

This allows you to position the window as you like, and PIXmate will try to use that location for the window in the future. Note that after dragging the Coordinate Display to a new position, you must click on the screen with the Left Mouse Button to activate the PIXmate screen again.

R5.5 The Credits Display

Selecting the last option in the Info Menu, labeled 'Credits', brings up a standard PIXmate Requester with information concerning the product itself. The version number, serial number, copyright notice, author, and publisher of PIXmate is listed here.

Figure R5.4
The Coordinate Display Window

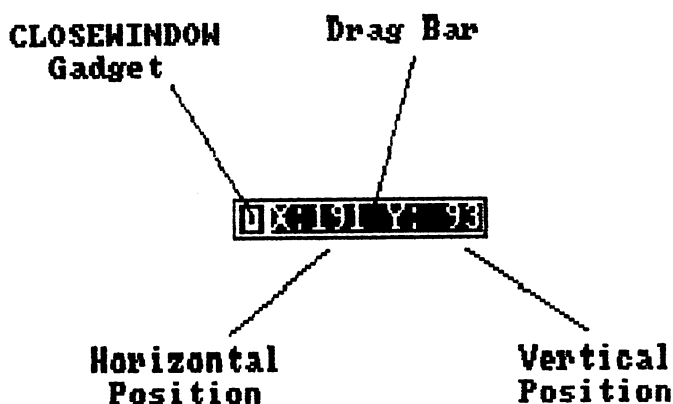


Figure R5.4 The Coordinate Display Window

R6.0 Working with Low RAM Conditions

Many of the operations PIXmate performs require enormous amounts of memory to succeed. If an operation fails or you get a low RAM warning from a PIXmate Requester, the cause is usually lack of CHIP RAM. In extreme cases, PIXmate may be unable to open a window or display a menu, much less complain about lack of RAM. Although every effort has been taken in PIXmate to recover in limited RAM conditions, it is still possible to crash the Amiga operating system by ignoring the warnings or operating very close to the limit of available RAM. For this reason, it is suggested you check your available RAM before performing image processing by using the 'Memory' option from the Info Menu, as described in section R5.1.

Section R5.1 goes into great detail on the memory requirements and limitations imposed by the Amiga hardware, which will not be repeated here. This section is devoted to helping you maximize the amount of RAM available on your machine.

The following is a list of suggestions that may help to increase the amount of CHIP RAM available on your Amiga, or to work around a RAM shortage. Some of the suggestions may not be applicable to your situation, or may seem painfully obvious; choose the parts that seem appropriate.

- * Buy more RAM. If you currently have 256K or 512K of memory, the addition of a memory expansion board will make a world of difference. There are several memory expansion boards on the market at a variety of prices, so you can easily add one or two megabytes of FAST RAM to your Amiga. *A RAM expansion is a good investment (ask any owner!)*, since it increases the performance and versatility of your Amiga.

- * Close excess screens, windows. This includes windows the WorkBench opens when you double-click on disk or drawer icons. Windows and screens consume CHIP RAM in proportion to their size and depth; if a window must stay open (for instance, the AmigaDOS CLI window), it may help to re-size the window as small as possible.

- * Kill/stop/exit all other programs that may be running in the Amiga multitasking environment. This includes clocks, text-speedup routines, mouse-accelerators, and other memory resident programs that you might have called from your startup-sequence.

* Do not use the WorkBench icon environment. The WorkBench consumes about 6K of CHIP RAM to display the disk icons and for other housekeeping purposes. By using the AmigaDOS CLI instead, this additional overhead is eliminated. To make the CLI environment the default, rather than the WorkBench, you set 'CLI ON' using the Preferences program from the 1.2 WorkBench disk. Make sure you do not have any 'EndCLI' commands in your startup-sequence, or the CLI will disappear when the machine re-boots. For more details on the CLI environment, see The AmigaDOS Users Manual.

* Avoid interlaced WorkBench screens. Interlace devours about 38K more CHIP RAM than non-interlaced WorkBench screens. Interlace is turned on or off using the 1.2 WorkBench Preferences utility; make sure it is set to 'OFF' and re-boot the machine after saving the new Preference settings.

* Make sure you do not use the 'AddBuffers' command in your startup-sequence. AddBuffers uses CHIP RAM for buffering disk information, and thus subtracts from the CHIP RAM available for image processing.

* Disconnect external disk drives, such as DF1:, before turning on your Amiga. Each additional disk drive uses about 32K of valuable CHIP RAM for track buffering.

* If you are using HIRES images, use PIXmate to convert your images to 320 by 200 or 320 by 400 before performing other operations. This will greatly reduce the amount of CHIP RAM needed by PIXmate for image display and processing.

* If you cannot perform full color processing on an image, use the 'Extract Gray' option to produce a black and white image, and work with that. Color processing takes up to four times as much CHIP RAM as processing monochrome images. Monochrome images are much faster to process, and for many applications, are preferable to color images.

* HAM images take more CHIP RAM than 32 color images, and are slower to process. Using PIXmate's 'HAM to 32' option before doing other processing may help.

R7.0 How the Amiga Graphics Modes Affect the Display

PIXmate allows you to work with images in any format or graphics mode, and permits you to easily convert images from one format to another.

However, there are advantages and limitations to each mode, so a firm understanding of the Amiga graphics modes may help you choose the best mode to use. This section describes the four graphics modes and their interactions in detail.

R7.1 The Four Basic Graphics Modes:

The Amiga computer has four basic graphics modes available for displaying images. These modes are similar to switches that can be turned 'ON' or 'OFF', independent of each other. Two of the modes, HIRES and LACE, affect the horizontal and vertical resolution of the display. The other two, HAM and EXTRA-HALFBRITE, affect the Amiga's interpretation of color information. Modes can be combined to produce other modes, such as HIRES LACE or HAM LACE. Due to current Amiga hardware limitations, not all combinations of modes are valid.

For the purposes of this manual, we will refer to the 'HIRES ON' mode as simply HIRES, and the 'HIRES OFF' mode as LORES. Similarly, 'LACE ON' is called LACE, and 'LACE OFF' is referred to as NOLACE.

Before we attack the subject of graphics modes, we need to discuss ColorMaps and bitmaps. ColorMaps are a way of organizing the palette of colors used by an image. The colors are stored as RGB color values, and are indexed by color number (also called pen number). These color numbers correspond to the 32 Amiga hardware color registers.

Bitmaps are a way of organizing pixels (picture elements) in a logical fashion, and are used by most computers that deal with graphics. Bitmaps contain a stack of one or more bitplanes that store the pixels in a left-to-right, top-to-bottom manner. The Amiga hardware determines a color number (also called a pen number) for each pixel in the bitmap, based on the information contained in the stack of bitplanes. This color number is converted to an RGB color value, using the ColorMap as a look-up table. This process is summarized by the diagram in Figure R7.0.

Bitmaps may be of virtually any width or height, up to 1024 by 1024 pixels. However, not all of the bitmapped image may fit on the screen, depending on the graphics mode and monitor or television you are using. This condition is known as overscan. Bitmaps have one or more bitplanes, up to a possible eight. The number of bitplanes a bitmap has (its depth) determines the number of colors available in the ColorMap. However, current Amiga hardware uses a maximum of six bitplanes for color purposes. Also, in HIRES mode, a maximum of four bitplanes may be used.

Normally, the following combinations of bitmap size and graphics modes are used:

Graphics Mode	Bitmap Size	Maximum Depth
LORES NOLACE	320x200	6
LORES LACE	320x400	6
HIRES NOLACE	640x200	4
HIRES LACE	640x400	4

Using bitmap sizes larger than the ones listed may result in overscan, and consume more CHIP RAM. Using bitmaps smaller than listed will result in underscan (i.e., the screen borders will be larger). Note that PIXmate will prevent you from creating bitmaps smaller than 320 by 200 pixels, since PIXmate needs at least this much to display menus and windows.

The following paragraphs describe differences between the possible graphics mode combinations. Unless otherwise stated, normal bitmap sizes are assumed.

LORES NOLACE: This is the lowest resolution mode available on the Amiga. It is also the fastest to process, and requires the least amount of RAM and storage space. LORES allows you to use up to six bitplanes for color information. Using five bitplanes, you can have up to 32 different colors in the image. Six bitplanes are used by the HAM and EXTRA-HALFBRITE graphics modes to further increase the number of colors available; these two modes are discussed at the end of this section.

LORES LACE: This may be the most useful graphics mode, since it provides reasonable resolution while retaining many of the advantages of LORES NOLACE. In addition, the 320 by 400 pixel format is the closest approximation to a one-to-one aspect ratio available on the Amiga. This is convenient in image processing because it results in nearly square pixels. However, the interlace technique used to double the vertical resolution may produce unacceptable display flicker in some instances. This is especially noticeable in images with narrow horizontal lines.

HIRES NOLACE: This is the graphics mode used by default for the WorkBench screen. It produces a fairly high resolution display without flicker, and is normally by text based applications since it allows 80 character by 25 line text displays without overscan. However, current Amiga hardware will handle a maximum of four bitplanes in HIRES mode, thus limiting you to a maximum of 16 colors.

HIRES LACE: This mode provides the highest resolution display available on the Amiga. For serious image processing applications where small details are important, this mode is recommended. As with HIRES NOLACE, a maximum of four bitplanes, 16 colors is imposed by the Amiga hardware. HIRES LACE images require huge amounts of RAM and storage space, and take almost eight times longer to process than LORES NOLACE images. In addition, the screen flicker problems mentioned in reference to LORES LACE apply.

R7.2 HAM 4096 Color Mode:

HAM mode (short for Hold And Modify) is a special graphics mode that uses six bitplanes to produce up to 4096 colors. Normally, it would take 12 bitplanes to produce a 4096 color image; HAM mode uses information contained in the fifth and sixth bitplanes to produce additional color values. In HAM mode, there are 16 primary colors available from the ColorMap. Additional colors are produced by modifying the current color value of the pixel to the left of a given pixel, and using the modified color value for that pixel. Thus, the previous pixel's color value is 'held', then 'modified' to produce the next pixel's color.

While it is beyond the scope of this manual to explain the ingenious method used to do this trick, some of the limitations of HAM mode need to be discussed here.

Since HAM mode requires six bitplanes, you cannot use HIRES and HAM mode together. Due to the nature of HAM mode, it is not possible to gain complete control of the color of every pixel in an image; it may take up to three pixels for a color to be modified from one value to another. This causes color smearing and false color effects in an image. Changing the color values in the ColorMap of a HAM image will have unpredictable effects, since not all of the colors used come from the ColorMap. HAM mode is not well suited to image processing, since additional computations are required to determine the color of a particular pixel.

R7.3 EXTRA-HALFBRITE 64 Color Mode: EXTRA-HALFBRITE mode (abbreviated EHB) uses six bitplanes to produce up to 64 colors in an image, without the color smearing problems associated with HAM mode. The first five bitplanes are used to select one of the 32 primary colors from the ColorMap. The information in the sixth bitplane determines whether a pixel uses the ColorMap color value, or a color value 'half-as-bright' as the one specified by the ColorMap.

Note that early models of the Amiga 1000 computer did not feature EHB mode.

You can use the following test procedure to determine if your machine supports EHB mode:

1. Using 'Load IFF' from the Project Menu, load the image named 'Lion.HAMLACE' from the 'Demo__Images' directory of your PIXmate disk. See section R1.2.1, 'Loading IFF Image Files' if you need help with this step.

2. Select 'HAM to 64' from the Color Menu. After about 20 seconds, the image will be converted from HAM to EHB mode.

3. If the lion looks essentially unchanged, congratulations, your machine supports EHB mode. If the lion has lots of oddly bright-colored areas in the facial region now, your machine does not support EHB graphics. You should contact your Amiga dealer for information on upgrading the graphics chip in your machine if this bothers you.

As with HAM mode, EHB only works in LORES. Changing one of the 32 primary colors also affects its half-bright relative; thus modifying colors using the Palette or Color Bias controls can have unpredictable results. Image processing will produce bizarre results with EHB images, since the color information is not organized in a natural sequence. There are no other programs known at this writing that support EHB graphics, so it may be pointless to use EHB mode if you need to export your images. PIXmate provides this mode for flexibility, and with the hope that more programmers will take advantage of this graphics mode in future software products.

FIGURE R7.0 **How Pixel Colors Are Determined**

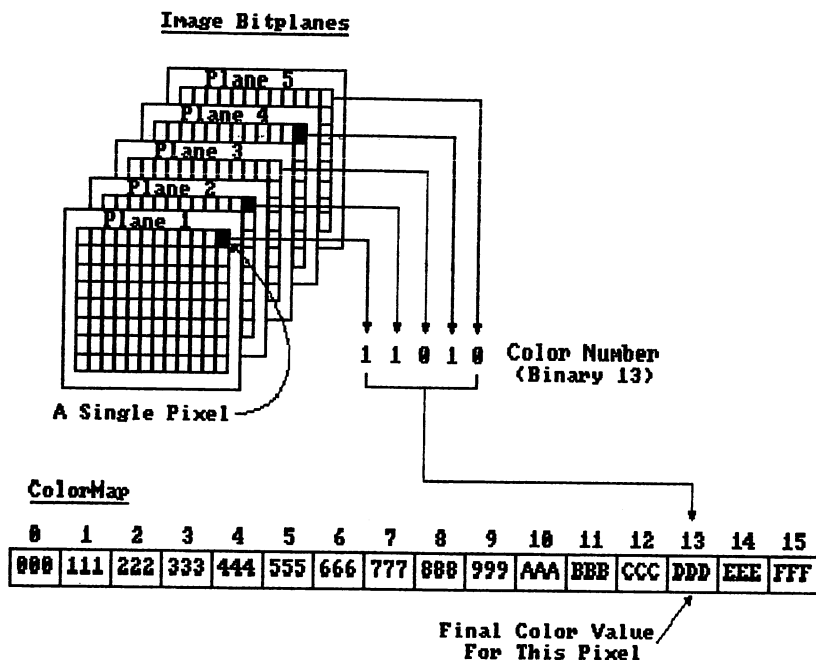


Figure R7.0 How Pixel Colors Are Determined

APPENDIX A

Tips and Techniques for Image Processing

While there are thousands of possible ways you can use PIXmate to process images, this section is devoted to detailing some of the more useful techniques or 'trick' operations. You can use these techniques like recipes from a cookbook, or as a source of inspiration when dealing with a particular image processing problem. Also, this section provides some general advice on image processing.

1. Image processing works best (i.e., gives the most reproducible results) when the ColorMap is logically organized. The easiest way to do this with non-HAM images is to use 'Pack Colors' from the Color Menu before you use other PIXmate features. HAM images require special treatment; you can either rely on PIXmate's automatic color processing, or manually perform color processing using a combination of 'Extract...' and 'AutoMerge...' from the Color Menu. Often, individual processing of the red, green, and blue images will yield better results, since you have greater control at each step in the process.

2. Full color processing takes much longer than processing monochrome images; you can use 'Extract Gray' from the Color Menu to produce a monochrome version of a color image. Work with the monochrome image until you get the effect you want; then try it on the color image.

3. Due to the oddities of HAM mode, working with HAM images can be slow and inconvenient. It often pays to first use the 'HAM to 32' option from the Color Menu before trying new processing techniques. When you find a technique that works, you can then use it on the original HAM image.

4. Processing 640 by 400 pixel images can take up to eight times as long as processing 320 by 200 pixel images, and requires huge amounts of memory. Use the 'ReFormat As 320X200' from the Effects Menu on HIRES images before experimenting with new effects. This will give you the fastest results and require the least memory. Once you find a nice effect, you can apply it to the original full resolution image.

5. When reducing the number of colors used by an image, especially when producing black and white images, there are four basic techniques PIXmate offers:

a. Select the Color Bias option from the Color Menu. Slide the Contrast control knob up to the top of the slide container. The result will be a nearly black and white image. If the dark/light balance is wrong, click 'Undo', adjust the Intensity slide so that the image is brighter or darker, click on 'Use', then use the Contrast control. Liberal use of the Undo feature combined with some experimentation should produce the balance you desire. Afterwards, you can use 'Undo Changes' if the Color Bias effects were unsatisfactory, or use 'Less Colors' to further reduce the number of colors used.

b. Select 'Image Process' from the Effect Menu. Set the Threshold slide control to the midpoint of its travel. Select 'Mono Mode' in the Process control section. Now click on the gadget labeled 'BIN'. The result will be a two color image, using the first and last colors in the ColorMap. By setting the Threshold to other positions, you can select the dark/light balance. The Palette can be used later to adjust the two colors that result from the 'BIN' operation.

c. Select 'Less Colors' from the Color Menu, BACKSPACE over the numbers in the box, erasing them. Press '2', then press RETURN. PIXmate will choose the two best color to use for the entire image, then re-color the image using just those two colors. Another trick is to 'sneak up' on the problem by reducing the number of colors used in stages. For instance, you may have a 32 color image you want to reduce to two colors. You may get different/better results by using 'Less Colors' to reduce the number of colors to 16, then 8, then four, then finally two.

d. Select 'HistoGraph EQ' from the Effects Menu. When the HistoGraphic Equalizer window appears, click the 'Adjust' gadget. Set all the equalizer settings at the bottom of their travel, then set the first and last settings to maximum. Now click on the 'ReMap' gadget. The result will be a two color image using just the colors you set to maximum with the equalizer.

6. The Image Processor has two primary techniques for enhancing edges and sharpening images. Select 'Image Process' from the Effects Menu. Now click on either 'USM' or 'LCE'. Compare the two effects; one may work better than the other for your application.

7. To quickly produce a photographic negative of an image without changing the ColorMap, bring up the Image Processor. In the Logic Control section, select the 'EOR' gadget, then click on 'LOGIC'. The image will be complemented, resulting in a negative image. This technique is especially useful for HAM images.

8. An interesting technique is 'double-enhancement'. To perform this, follow the steps outlined in Tip #6 and Tip #7. This will produce a negative image of the enhanced original. Reset the Logic Control to 'NOP' mode. Now perform Tips #6 and #7 again. This will enhance the negative, and convert the negative back to positive, resulting in a greatly sharpened image.

9. When enhancing edges or sharpening images, it often helps to first use the HistoGraphic Equalizer to improve the contrast of the image before enhancement. To do this, bring up the HistoGraphic Equalizer, select 'Adjust', then set all the equalizer settings to the same level. Click on 'ReMap' to process. Now perform the desired image processing functions with the Image Processor, such as described in Tip -6.

10. Although PIXmate 1.0 does not have a way of printing text on top of an image built in, you can use the 'Grab Next Screen' feature from the Edit Menu along with an AmigaDOS CLI to do the job. With PIXmate running, bring the Workbench screen to the front and type in the text you want into the CLI (or a word processor). Switch back to the PIXmate screen, and load the image you want to add text to. Select 'Kill Other Scrn', then 'Flip to Other' from the Edit Menu. This will give you a fresh blank screen to put text on. Now select 'Grab Next Screen' from the Edit Menu. Anything visible on the Workbench screen will be copied onto the PIXmate screen. Now you can use 'Match Palette With Other' from the Color Menu, and 'Clip to Other' to actually place the text on your image. Many useful and unusual effects can be created using this technique.

APPENDIX B

Warnings, Error Messages, and Recovery Procedures

PIXmate has extensive error checking and error recovery features. PIXmate will automatically handle normal difficulties, however, some problems may require your attention. Problems can come from many sources; you may be asking PIXmate to perform a nonsensical operation, or there may be insufficient memory to carry out your command. When working with files, possible problems include: disk overflow, bad disks, files in the wrong format, bad file names, and files that do not exist.

Regardless of the cause, PIXmate will inform you of the problem using a special window called a Requester.

Each PIXmate Requester has a title that summarizes the problem, a short description of the problem, perhaps a word of advice, and one or two options you can select to continue. These options appear as small labeled boxes at the bottom of the Requester. Figure B shows a typical PIXmate Requester. You choose one of the options, either by moving the mouse pointer over the option box and clicking the Left Mouse Button, or by using the keyboard shortcut keystrokes. To select options with the keyboard, press the LeftAmiga-V keys together to select the leftmost option; press the LeftAmiga-B combination to select the option on the right of the requester. Either way, PIXmate will stop and wait until you make a selection before proceeding. PIXmate also uses these requesters to provide information, and to confirm your selection of an operation that would erase an existing file.

If you are severely low on memory, PIXmate may not be able to create a requester. In these situations, an Alert will be used to show the information instead. An Alert is easy to recognize; the text is printed in red letters on a black background, and a flashing red border surrounds the text. If you get an Alert, you can still press the Left or Right Mouse Buttons to make a selection and continue; PIXmate will recover if possible. See the section 'Working with Low RAM Conditions' for more details. Suffice to say, Alert-causing conditions are to be avoided, since they indicate that the Amiga is dangerously close to running out of memory. You should quit PIXmate as soon as possible and try to make more memory available.

APPENDIX C

Suggested Reading

After using PIXmate awhile, you may wish to learn more about the exciting field of image processing. Below is a recommended reading list that provide an easy-to-read introduction to computer graphics and image processing.

Artwick, Bruce "Microcomputer Displays, Graphics, and Animation," (previously published as Applied Concepts in Microcomputer Graphics), Englewood Cliffs, NJ: Prentice-Hall, 1985.

Dawson, Benjamin "Finding the Titanic," Peterborough, NH: BYTE (McGraw-Hill), March 1986,

Dawson, Benjamin "Introduction to Image Processing," Peterborough, NH: BYTE (McGraw-Hill), March 1987,

Hall, Ernest L., "Computer Image Processing and Recognition," New York, NY: Academic Press, 1979.

APPENDIX D

Customer Service and Support

At Progressive Peripherals and Software, Inc., we have a commitment to providing you not only excellent products, but also excellent support. It is vital that you fill out and return the PIXmate Registration Card included with the PIXmate software and manual. Unless we receive your Registration Card, we will be unable to confirm that you are a registered owner. Only registered PIXmate owners are eligible for technical support and software updates.

We want to know about what you like and dislike about PIXmate. If you find PIXmate useful for an application, tell us about it! If PIXmate is missing a feature you think it needs, let us know and we will incorporate the best suggestions in future updates or in a later version. If you have a specific application in mind, PIXmate can be easily customized to meet your special needs; contact us for details.

Nobody likes bugs, but experience suggests that any program of this complexity is bound to have a few problems. If you encounter a problem using PIXmate that is not covered by the manual, try to remember what you were doing when the problem occurred. Try to recreate the exact circumstance that caused the problem, and see if you can repeat the problem. If you can reproduce the problem, send us the steps you used, using the Problem Report Sheet from the back of the manual. We will try to reproduce the problem on our machines, and if it is due to a defect in the PIXmate software, issue an update that remedies the problem as soon as possible.

***Progressive Peripherals and Software, Inc.
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Glossary of Terms

Alert In the Amiga context, an Alert is a startling message generated by a program or by the operating system. Alerts are used in desperate situations to communicate information to the user; they are printed in ominous red letters on a black background, and have an unmistakable flashing red border. A common example of an Alert is the infamous Guru Meditation Alert, which provides information on the cause of a major software failure to the knowledgeable user. PIXmate uses Alerts in emergency situations where there is insufficient CHIP RAM to use a regular window to display text. To exit an Alert, simply press the Left or Right Mouse Button, as prompted by the text at the bottom of the Alert.

AmigaDOS The operating system used by the Amiga to store and retrieve information, and to run programs. AmigaDOS is itself a collection of programs that work together to control the Amiga. AmigaDOS also provides the foundation for the CLI environment (see CLI).

Backup A computer slang term for making a copy of a file or disk. This copy (the backup) is usually put in a safe place, in case the original file or disk is destroyed. Also, if you make frequent changes to a particular file (perhaps an image file), you should make copies of the file between changes. Later, you can 'back up' to the last version of the file, if for some reason you want the old file back.

Binary A way of representing any number using only zeros and ones. Computers use binary numbers to store and process information in memory. The computer's memory works like a collection of on/off flags that represent '0' or '1'. Each one of these on/off flags are called bits. Eight of these bits combine to make a byte, a standard measurement of memory size.

Bits See Binary.

Bitmap A bitmap is an organized way of storing image data in memory. Most computers, including the Amiga, use bitmapped graphics nowadays. A bitmap contains one or more bitplanes, and the number of bitplanes in a bitmap determine the number of colors available for that image.

Bitplane A bitplane is a rectangular area of image data that is stored in binary format. Each pixel that is 'on' in the image has a corresponding bit set to '1' in the bitplane, each blank space is represented by a '0' in the bitplane. Thus for strictly two-color images, only one bitplane is needed to represent the on/off pixel values. For more colors, more bitplanes are necessary. The Amiga hardware currently supports up to six bitplanes of data.

Blitter The Amiga has a high-performance graphics engine called the blitter that can be used to move image data (pixels) much faster than using a microprocessor. Physically, the blitter is part of a large integrated circuit (a custom chip) inside your Amiga. The blitter, like other custom chips in the Amiga, can only access data in CHIP RAM.

Boot The process of awakening a computer or loading a program for use, e.g., turning on the power, inserting disks, typing magic words, etc. The process of turning on the power to the Amiga is referred to as a Cold Boot. By pressing the CTRL-LeftAmiga-RightAmiga key combination (on the Amiga 500 and 2000 the LeftAmiga key has been changed to the Commodore key), the Amiga undergoes a complete reset process known as a Warm Boot. This can be used to reset the machine after a crash.

Buffer A temporary storage area in memory that the computer can use as a scratch pad for calculations, or as a place to put information until it is used by the program.

Bug As applied to software, a failure or defect that decreases the usefulness of a program. Hopefully, PIXmate does not have any bugs, but nobody is perfect.

Byte See Binary.

Chip A complex electronic component that combines the function of hundreds or thousands of individual devices into a single package, commonly called an integrated circuit (IC). The Amiga hardware has several custom chips that handle the display, sound, and other system needs.

CHIP RAM The Amiga has two types of memory, called CHIP RAM and FAST RAM. The current Amiga hardware allows you to have up to 512K of CHIP RAM, and up to 16 megabytes of FAST RAM. CHIP RAM is the only memory that the custom chips, inside the Amiga can use.

CLI Short for Command Line Interface, the CLI is the keyboard oriented way to control the Amiga. You type commands (a line of text on the screen), then press RETURN and the command is performed. The CLI environment is a flexible alternative to the mouse and icon system used by the Workbench.

Clicking The act of positioning the mouse pointer directly over a gadget or icon, then pressing and releasing the Left Mouse Button. This technique is used to select icons, and to activate gadgets.

Color In the context of this manual, the term refers to a mixture of red, green, and blue. Note that 16 shades of gray are considered 'color' by this definition.

ColorMap A ColorMap is an organized way of storing color values. The Amiga hardware currently supports 32 color registers, which are filled by the program from the current ColorMap. A ColorMap can be thought of as the current palette of colors available for use.

Crash A computer slang term used to describe a major software or hardware failure. A crash is usually accompanied by a Guru Meditation Alert (see Alert), or in extreme cases, wild unpredictable phenomena. A software crash can be remedied by re-booting (see Boot) the computer. A related malady of the crash occurs when the computer enters a dead-end situation, often referred to as 'hung', 'locked', or 'frozen' to describe its unresponsive state. A reset is needed to remedy this situation.

Directory A place where files are stored, similar to a filing cabinet. Each directory has a name associated with it. From the Workbench environment, directories appear as small icons that look like drawers from a filing cabinet. A directory may contain other directories, often referred to as subdirectories.

Double-Clicking The act of positioning the mouse pointer over a gadget or icon, then pressing and releasing the Left Mouse Button twice in quick succession.

Drag Bar The top edge of most screens and windows have a combination title bar and drag bar. By positioning the mouse pointer over the drag bar, then pressing and holding the Left Mouse Button down, the drag bar is activated. You can then drag the screen or window to a new position, releasing the mouse button when you are ready to drop the window or screen. See also Title Bar.

Dragging The act of positioning the mouse pointer over an object (e.g., an icon or drag bar), then holding down the Left Mouse Button. While the button is depressed, the object can be moved around by sliding the mouse in the desired direction. Releasing the button drops the object at its current position.

EXTRA-HALFBRITE Abbreviated EHB, this is a new Amiga graphics mode that allows up to 64 colors to be displayed on the same screen.

FAST RAM One of the two types of RAM available on the Amiga. Additional FAST RAM can be added to the Amiga, up to 16 megabytes. See CHIP RAM.

File A file is a way to store computer information for later use. Each file is identified by a name that is associated with it, called a filename. Programs, like PIXmate, or data for use by programs are stored in files. See also Directory.

Gadget A type of software control, usually with a rectangular border. Gadgets often mimic familiar controls like pushbuttons or volume controls, and usually contain printed or pictorial labels. Gadgets are activated by positioning the mouse pointer directly over the gadget, then pressing and releasing the Left Mouse Button. A special class of Gadgets, called String Gadgets, allow you to enter text or numbers from the keyboard after being activated.

HAM Short for Hold-And-Modify, HAM is a special graphics mode that allows all 4096 colors in the Amiga palette to be displayed on the same screen.

Hardware The electronic and mechanical parts of a computer system. See Software.

HIRES Short for High-RESolution, HIRES is a graphics mode that doubles the number of pixels that will fit on a horizontal line of the screen.

Histogram A bar-graph style chart, usually used to display relative values or numeric totals. The vertical height of the bars are directly proportional to the values being represented.

Icon An icon is a small pictorial representation of an object, and are related to gadgets. The Workbench screen uses icons to represent disks, drawers, files, and programs. You can drag icons to new positions on the screen using the mouse, and you can activate an icon by double-clicking on it at its current position.

Image In the context of this manual, the term applies any picture or part of a picture that PIXmate can load and display. Artwork created with a paint program or pictures digitized with a camera are two examples of images.

Interlace A video technique used to double the number of lines on the screen, thus doubling the vertical resolution. Due to the nature of the interlace technique, a 'flickering' effect may result since the screen is re-drawn only half as often using interlace.

Intuition Intuition is the Amiga mouse and icon system designed to make control and display consistent between different programs. The Workbench screen, with its icons, menus, windows, and gadgets, is a good example of using Intuition. Intuition provides a variety of programming tools to help programmers keep their programs friendly and familiar to use. Intuition is also a program that is running on your Amiga; Intuition manages the mouse and display.

K Abbreviation used to represent 1000 bytes (one kilobyte). For instance, 512,000 bytes is commonly referred to as 512K.

LACE See Interlace.

Load The process of reading a program or file into memory, usually from a disk drive.

Menu On the Amiga, a menu is a standard Intuition control system that offers the user a variety of labeled choices. Intuition menus are part of the screen, and communicate with the program they control using windows. Most menus are of the drop-down variety; they 'drop down' from the top of the screen when you depress the Right Mouse Button and slide the mouse pointer over a menu header on the Screen Title Bar. The printed choices, called menu items, appear inside the rectangle that drops down from the menu header.

Monochrome In so far as PIXmate is concerned, monochrome refers to colors of the same shade. The Amiga hardware can produce 16 shades of red, green, or blue, which when combined, produce 16 shades of gray. A monochrome image is one that uses only shades of the same color, for instance, a black and white image.

Mouse Pointer In PIXmate, the mouse pointer is a small, cross-hair shaped cursor that can be moved about the screen using the mouse. The pointer shows the exact point the mouse is currently positioned at. The default Workbench mouse pointer is a small red arrow, but mouse pointers can come in almost any shape or color. One common variation is the 'ZZ' busy cloud image that appears when PIXmate or the Workbench are busy performing some operation.

Multitasking A feature of the Amiga operating system that permits several programs to appear to run simultaneously.

Overscan Technically, overscan refers to the parts of a television picture that fall off the edges of the screen. Often, people will incorrectly refer to any image that completely fills the screen (i.e., no visible border surrounding the image) as being overscanned.

Palette As applied to the Amiga, the palette is the range of available colors that can be generated by the hardware. Current Amiga hardware produces a palette of 4096 different colors. The term palette is also commonly used to refer to the current ColorMap used by an image (see ColorMap).

Path A path or pathname is a unique name specifying a particular file and directory in the Amiga filing system. Pathnames can be thought of as the full name of a file, similar to the full name of a person.

Pixel Short for 'picture element', a pixel is the smallest dot that can be displayed on the current display device, i.e., monitors, televisions, and printers. For instance, the standard Workbench screen is composed of an array of 640 by 200 pixels, giving a total of 128,000 pixels. Pixels may be any one of 4096 possible colors on the Amiga.

RAM Abbreviation for Random Access Memory. This type of memory is generally non-volatile, i.e., when you turn the computer off, any information in RAM is permanently lost.

RAM Disk An alternative to floppy disk drives or hard disk drives, the RAM disk is an imaginary disk drive simulated in the computer's memory. RAM disks are many times faster than their physical counterparts, but require more computer memory to use. Also, any information stored in the RAM disk will be lost when the power is turned off to the computer.

Raster A video term describing the way information is organized in a television image. Raster images are composed of horizontal lines, called scan lines, drawn left-to-right, top-to-bottom on the screen.

Register Registers are special memory locations used by the computer to store information that is needed often or without delay. Special registers in the Amiga store the colors and type of display to use when generating images.

Resolution This relates to the number of dots-per-inch possible on the display (e.g., the number of pixels on the screen), and affects the sharpness of an image. Using high resolution (i.e., more pixels per inch) allows smaller details in an image than low resolution will, since the pixels themselves are smaller.

Run A computer-related verb, running a program refers to the task a program performs after loading into memory. After the Amiga boots, several programs are running. 'Run' is also an AmigaDOS command that allows you to have several active programs running in an apparently simultaneous fashion.

Save The process of storing a program or file in the computer's memory to a more permanent storage place, such as a disk drive.

Screen A screen is the basic Intuition display, that can contain graphics, text, windows, and gadgets. A screen usually has a title bar, that displays text generated by programs.

Software The programs and files (information) that control the hardware. Without software, hardware is useless, since the software instructs the hardware how to behave and interact with the real world.

String A string is a series of characters of indefinite length, usually a line of text or a name.

Title Bar A title bar is a rectangular label area at the top of most screens and windows. A title bar is used to identify a particular screen or window, and can be used by the program as a display area to print other information. Most title bars can also be used as drag bars to move a screen or window with the mouse.

Window A window is a rectangular area of the screen that can be used to display graphics and text, and acts as a communications medium between a program and its user. Most windows contain Gadgets that control operations or allow the user to affect the action taken by a program.

Workbench The Workbench is the Amiga's icon and mouse control system for operating the Amiga. The Workbench uses the basic Intuition tools (see Intuition) to interact with the user and Amiga. See also CLI.

- Action gadgets, R-7, R-51
- Add buffers, R-76
- Adjust gadget, R-64
- Alert, G-1
- Alpha gadget, R-9
- Amiga graphics modes, R-22, R-76
- Amiga ROM Kernal manual, R-9
- AmigaDOS, I-4, R-1, R-13, R-3, R-8, G-1
- AND gadget, R-54
- Atari 520ST or 1040ST, R-12
- Auto Color mode, R-61
- Auto-repeat, R-5
- AutoHAM, R-61
- Automated image recognition, R-58
- Merges
 - automatic RGB merges, R-35
 - specialized merges, R-35
- Average mode, R-49
- AVG gadget, R-56
- Backup copies, I-3, G-1
- Barrel-shifting, R-25
- BIN gadget, R-57, R-59
- BIN process and desktop publishing applications, R-57
- Binary decision process, R-57
- Binary, G-1
- Bitmaps, R-77, G-1
 - width, R-44
- Bitplane, G-2
 - allocation, R-42
 - drop, T-10
 - gadgets, R-42, R-44
 - rotation gadget, R-44
- Bits, G-1
- Blitter, G-2
- Boot, G-2
- Buffer, G-2
- Bug, G-2
- Byte, G-2
- CANCEL gadget, R-31
- Centering the screen, R-16
- Checking RAM, R-67
- Chip, G-2
- CHIP RAM, R-67, G-2
- Clearing part of the screen, R-16
- Clearing the screen, R-16
- CLI, T-2, G-3
- Clicking, G-3
- Clip, R-16, R-73
 - feature, R-64
 - gadget, R-63, R-72
 - mode, T-4, R-16, R-18
 - region, R-64
 - to Other, R-18
- CLOSEWINDOW box, R-40
 - gadget, I-6, R-14, R-20, R-31, R-28, R-48

- CMY (Cyan-Magenta-Yellow) option, R-33
- Color adjustments, T-6
 - balance, R-29
 - bar, T-6, R-22, R-23, R-63, R-72
 - box, R-23
 - distribution, R-64
 - menu, R-28
 - operations, R-20
 - slide knobs, R-23
 - value, R-23
- Color bias, T-8, R-28, R-29, R-80
 - window, T-7, R-27
- Color cycling, R-24, R-25, R-20
- Color extractions, T-9, R-33
- Color mode, R-49
 - conversions, R-36
 - gadget, R-46
- Color usage statistics, R-72
- ColorMap, R-22, R-25, R-28, R-30, R-38, R-57, R-66, R-77, G-3
- Complementing colors, R-39
- Compression, R-10
- Conjunctive logical operations, R-54
- Contrast
 - adjustments, R-28
 - controls, T-8
 - enhancement, R-61
- Converting IFF to Neochrome format, R-12
- Converting HAM 4096 color images to 32 colors, R-37
- Converting HAM 4096 color images to 64 colors, R-37
- Converting LORES image to Less Colors, R-66
- Coordinate display, R-73
 - window, R-73, R-74
- Coords option, R-73
- Copies, I-3
- Copy
 - gadget, T-7
 - palette, R-39
 - to Other Screen, T-3, R-18, R-19
- Count gadget, R-73
- Crash, G-3
- Creation, R-5
- Credits display, R-73
- Current Screen, T-3, R-15
- Cut
 - to Other, R-18, T-4
 - part of an Image to the Other Screen, R-18
- Cycle direction gadget, R-26
- Cycle range, R-25
- Cycle speed, R-26
- Data mode gadgets, R-60
- Data modes, R-53, R-60
- Date gadget, R-9
- Date of creation, R-5
- Deleting files, R-12
- DeluxePaint, R-19

- DeluxePaint II, R-26
- Depth arrangement gadgets, R-4, R-5
- Device gadgets, R-8
- Digi-View image files, R-12
- Directory, G-3
- Disks
 - care, I-3
 - duplication, I-3, I-4
- Display area, R-5
 - format, R-69
- Display control, R-66
 - window, R-11, R-19, R-40, R-41, R-44, R-48, R-49
- Dithering, see Pixel Randomizing Technique
- Double-Clicking, G-3
- Drag bar, G-3
- Drive-activity light, R-3
- Dynamic range, R-61
- EA IFF 86, R-9
- EDG gadget, R-58
- Edges
 - detection, R-58
 - enhancement, R-58
- Editing
 - gadgets, R-24
 - menu, T-4, R-14, R-24, R-15, R-19
 - features, T-2, T-3
- Effects menu, T-10, R-40
- EHB, see EXTRA__HALFBRITE, R-79
- Electronic Arts IFF 85 standard, R-9
- Empty directory!, R-4
- EOR (EitherOR)
 - gadget, R-54
 - logical operations, T-11
 - mode, R-55
- Equalizer, R-64
- Evenmode, R-49
- Exch gadget, T-7, R-24
- Exchanging palettes, R-39
- EXTRA__HALFBRITE color mode, R-22, R-36, R-45, R-79, R-77, G-4
- Extract
 - gray, R-64, R-76
 - operations, R-33
- RGB operation, R-35
- FAST RAM, R-67, G-4
- File, G-4
 - compression, R-10
 - display area, R-5, R-6, R-7
 - formats, R-11
 - selector, T-1, T-2, R-1, R-3, R-7, R-8, R-4, R-34, R-35
 - string gadget, R-5, R-7, R-13
- File name, R-1
- Find mode, R-24
- Flip
 - gadget, R-53, R-60

- to Other Screen, T-3, T-4, R-17
- X, R-49
- Y, R-49
- Format Information Requester, R-70
- Format option, R-69
- Fred Fish Public Domain Library, R-9
- Gadgets, R-5, R-46, G-4
- Glossary, I-3
- Grab
 - another screen, R-19
 - DeluxePaint Screens, R-19
 - next screen, R-19
- Graphics mode combinations, R-78
- HAM (Hold And Modify) color mode, G-4
 - images, R-33
 - mode, R-29, R-35, R-36, R-37, R-45, R-47, R-63, R-77
 - to 32, R-31, R-37, R-66
 - to 64, R-37
- Hard disk drive, I-4
- Hardware, G-4
- Hexadecimal sequence, R-23
- HIRES mode, R-36, R-42, R-45, G-4
- HIRES LACE images, R-12, R-17, R-61, R-66, R-77, R-78
- HIRES NOLACE, R-46, R-78
- Histo, R-73
- Histogram, G-4
 - specification, R-61, R-64, R-66
- Histograph EQ, R-63
- HistoGraphic Equalizer, R-61, R-73
 - window, R-62, R-73
- Hold And Modify, see HAM
- HSV mode, R-23
- Hue, R-22, R-23
- Icon, G-4
- IFF (Interchange File Format)
 - image files, R-9, R-10
 - palettes, R-11
- ILBM (InterLeavedBitMap), R-9
- Image file management, R-1
- Image, G-5
 - recognition, R-58
- Image Processing, I-2, R-51
- Image Processor, T-10, T-11
 - data flow diagram, R-52
 - window, R-50
- Infinite response, R-29
- Info menu, R-67, R-69
- Installation, I-4
- Intensity controls, T-8, R-28, R-29
- Interchange File Format, see IFF
- Interlace, G-5
- Intuition, G-5
- K (Kilobytes), G-5
- Kernal gadgets, R-58
- Keyboard auto-repeat speed, R-17

- Kickstart/Workbench version 1.2, I-5
- LACE, R-46, R-77, G-5
- LAP gadget, R-58
- Laplacian correlation;, R-57
- Last Dir, R-8
- LCE gadget, R-57
- Legal names, R-1
- Less Colors Window, R-32
- Limit
 - control, R-59
 - filter, R-59
- LOAD, I-7, G-5
 - gadget, R-51
 - IFF, R-13, R-80
 - from the AmigaDOS CLI, I-4
 - from the Workbench, I-4
- Local Contrast Enhancement, R-57
- Logical
 - control R-55, R-58
 - devices, R-8
 - gadget, R-53, R-55
 - operations, T-11, R-53
- LORES graphics mode, R-12, R-36
- LORES images, R-19, R-35, R-45
- LORES LACE images, R-37, R-46, R-78
- LORES NOLACE images, R-37, R-78
- LORES, R-77
- LORES/HIRES gadgets, R-46
- Low RAM conditions, I-5, R-75
- Luminance, R-22, R-23, R-29
- Main window, I-6
- Matching colors, R-38
- Matrix operations, T-12, R-53, R-58, R-59
- Median filter process, R-56
- Memory available requester, R-68
- Memory option, R-67
- Memory usage, R-67
- Menu, G-5
- Merge RGB, R-36
- Mono mode, T-12
- Monochrome, G-5
- Mouse pointer, G-6
- Moving and centering the screen, R-16
- Moving the image on the screen, R-16
- Multiple filenames, R-13
- Multitasking, G-6
 - with other programs, R-18
- Neochrome image files, R-12
- NewTek's LORES HAM images, R-12
- NIL, R-8
- No Next File, R-14
- No Previous File, R-13
- NOLACE, R-46
- NOLACE/LACE gadgets, R-46
- NOP (No-Operation), T-11, R-54

- NOT
 - flag, R-55
 - gadget, R-55
 - operation, R-55
- NTSC video circuitry, R-46
- Odd mode, R-49
- Operating conveniences, T-2
- OR gadget, R-54
- Other screen, T-3, R-15, R-17, R-53
 - kill other screen, R-18
- Overscan, R-77, G-6
- Packing colors, R-30
- Paint programs, R-38
- Palette, I-7, G-6
 - controls, R-80
 - title bar, R-20
 - window, T-6, R-20, R-21, R-22, R-24, R-30, R-72
- Parent gadget, R-8
- Path, R-6, G-6
 - not Found!, R-4
- Path-Master(tm) File Selector, R-2, R-9, R-35
- Pathname, R-1, R-6
- PATTERN, R-6
- Pattern not found!, R-7
- PIX Low Memory Warning, I-5
- Pixel, G-6
 - count window, R-71, R-72, R-73
 - operations, R-53, R-56, R-59
 - operations, T-11
 - randomizing technique, R-56
- PLANES label, R-42
- Pointer, G-6
- Pointer sprite, R-15
- Preference utility program, I-6
- Preferences, R-3, R-17
- Previous File, R-13
- Processing mode, R-60
- Project menu, T-1, R-4, R-9
- Pseudo-Coloring, R-39
- RAM (Random Access Memory), G-6
 - checking, R-67
 - disk, G-6
 - expansion, R-75
- Random Processing, R-59
- Randomizing, R-56
- Range gadgets, R-24
- Raster, G-6
- Raster-scan XY coordinates, R-73
- Raw Image Format, R-11
- Read operations, R-13
- Read Palette, R-14
- ReCenter, R-16
- Reform
 - gadget, R-46
 - process, R-47

- ReFormat As, R-66
- Reformatting an image, R-47
- Register, G-7
- ReMap R-64, R-66
- Resizing an Image, R-48
- Resolution, G-7
- RGB color value, R-23, R-77
- RGB mode, R-23
- RGB/HSV gadget, R-23
- RND gadget, R-56
- Rotate Bitplane Operation, R-43, R-44
- Running more than one PIXmate, R-18
- Saturation, R-22, R-23
 - adjustments, R-28
 - controls, T-8
 - slide control, R-29
- Save, G-7
 - IFF, R-10
- Screen, G-7
 - title bar, R-15, R-17, R-19, R-72
- Scroll gadgets, R-5
- Selecting
 - colors, R-22
 - filename, T-2, R-4, R-5
 - multiple filenames, R-13
- Size gadgets, R-9, R-48
- Slide controls, R-59
- Slide gadgets, R-5, R-6
- Slide show viewer, R-14
- Sobel edge, R-58
- Software, G-7
- Solarization, I-2, R-39
- Sort gadgets, R-9
- Sorting ColorMap by intensity, R-30
- Sprd gadget, T-7, R-24, R-25
- String, G-7
 - gadgets, R-3, R-6
- SUB gadget, R-54
- Subtractive data operation, R-54
- Swap
 - gadget, T-7, R-24, R-44
 - palettes, R-39
- Thinner gadget, T-10
- THR gadget, R-58, R-59
- Thresh, R-59
- Threshold slide control, R-57, R-59
- Time of creation, R-5
- Title bar, T-1, T-2, T-3, I-4, I-5, R-6, G-7
- Title screen, I-4
- Toggle sprite, R-15
- Tutorial, T-1
- UnClip, R-63, R-72
- Undo buffer, R-17, R-34

- kill undo buffer, R-15
- Undo feature, T-9, T-4, I-7, R-66
 - disable undo feature, R-15, R-17
 - gadget, T-7, R-23, R-29, R-51
 - changes, T-3, R-14
 - operations, R-14, R-15
- Unitext, R-43
- Unsharp component, R-57
- Usage count, R-72
- USM gadget, R-57
- ViewModes, R-22, R-45, R-46
- Volume not available!, R-4
- Warm boot, R-4
- Wildcards, R-1, R-13, R-14
 - names, R-35
- Window, G-7
- WorkBench, R-13, R-3, R-4, G-7
 - colors, R-22
 - version 1.2, I-6
- WritePalette, R-39

NOTES

